

MONTANA STANDARDS AND EXPANDED BENCHMARKS FOR SCIENCE

Science is an inquiry process used to investigate natural phenomena, resulting in the formation of theories verified by directed observations. Inquiry challenges students to solve problems by observing and collecting data and constructing inferences from those data. In scientific inquiry, a problem is identified, pertinent data is gathered, hypotheses are formulated, experiments are performed, the results are interpreted, and conclusions are drawn. Students acquire and apply critical thinking and problem-solving skills necessary to participate as citizens in dynamic, global technological societies.

Content standards indicate what all students should know, understand, and be able to do in a specific content area.

Benchmarks define our expectations for students' knowledge, skills, and abilities along a developmental continuum in each content area. That continuum is focused at three points—the end of grades 4, 8 and 10.

The following standards are for all students, and the expanded benchmarks are specifically labeled throughout the document:

Content Standard 1 - Students design, conduct, evaluate, and communicate processes and results of scientific investigations, and demonstrate the thinking skills associated with this procedural knowledge.

Content Standard 2 - Students demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems, and demonstrate the thinking skills associated with this knowledge.

Content Standard 3 - Students demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment, and demonstrate the thinking skills associated with this knowledge.

Content Standard 4 - Students demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space, and demonstrate the thinking skills associated with this knowledge.

Content Standard 5 - Students understand how scientific knowledge and technological development impact today's societies and cultures.

Content Standard 6 - Students understand historical developments in science and technology.

MONTANA STANDARDS AND EXPANDED BENCHMARKS FOR SCIENCE

Science Content Standard 1

Students design, conduct, evaluate, and communicate processes and results of scientific investigations, and demonstrate the thinking skills associated with this procedural knowledge.

Essence of Standard 1:

Rationale

Students must understand the process of science—how information is gathered, evaluated, and communicated to others. Learning by inquiry mirrors the process of science itself. The knowledge and skills related to scientific inquiry enable students to understand how science works. Inquiry allows students to construct understanding of scientific facts, principles, concepts, and applications. In addition, scientific inquiry stimulates student interest, motivation, and creativity.

Safety is a fundamental concern in all experimental science. Appropriate safety procedures must be applied when storing, using, and caring for materials.

All science content standards need to incorporate this process of scientific inquiry.

Benchmarks

Grade 4

Students will:

1.1 Plan and safely conduct scientific investigations when given a question, identified variables, and a testable hypothesis.

Expanded Benchmarks

1.1.1 Understand the question, variables, and hypothesis when provided with an investigation.

- 1.1.1.1 Attend to a scientific question.
- 1.1.1.2 Attend to things that change.
- 1.1.1.3 Attend to things that stay the same.
- 1.1.1.4 Attend to a guess or prediction.
- 1.1.1.5 Identify a scientific question.
- 1.1.1.6 Identify things that change.
- 1.1.1.7 Identify things that stay the same.
- 1.1.1.8 Identify a guess or prediction.
- 1.1.1.9 Ask a question.
- 1.1.1.10 Given an investigation, make a prediction about the outcome.
- 1.1.1.11 Given an investigation, identify the question that is being examined.

Expanded Benchmarks

1.1.2 Conduct a safe investigation when given step-by-step instructions.

- 1.1.2.1 Attend to the tools and resources needed for the investigation.
(Note: Tools are placed on the table.)

- 1.1.2.2 Identify the tools and resources needed for the investigation.
(Note: Tools are placed on the table.)
- 1.1.2.3 Gather the tools needed for the investigation.
(Note: Tools are placed on the table.)
- 1.1.2.4 Attend to the steps of the investigation.
- 1.1.2.5 Identify the steps of the investigation.
- 1.1.2.6 Implement each step as directed.
- 1.1.2.7 Attend to the results of the investigation.
- 1.1.2.8 Identify the results of the investigation.

1.2 Select and use appropriate tools.

Expanded Benchmarks

- 1.2.1 Use tools to investigate.
 - 1.2.1.1 Attend to tools that enlarge (ex. magnifier).
 - 1.2.1.2 Attend to tools that make sounds (ex. drums).
 - 1.2.1.3 Attend to tools that make sounds louder (ex. amplifier).
 - 1.2.1.4 Identify tools that enlarge (ex. magnifier).
 - 1.2.1.5 Identify tools that make sounds (ex. drums).
 - 1.2.1.6 Identify tools that make sounds louder (ex. amplifier).
 - 1.2.1.7 Use tools that enlarge if appropriate for the student.
 - 1.2.1.8 Use tools that make sounds.
 - 1.2.1.9 Use tools that make sounds louder.

Expanded Benchmarks

- 1.2.2 Use tools to make measurements.
 - 1.2.2.1 Attend to common tools to measure length.
 - 1.2.2.2 Attend to common tools to measure weight.
 - 1.2.2.3 Attend to common tools to measure volume.
 - 1.2.2.4 Attend to common tools to measure temperature.
 - 1.2.2.5 Attend to common tools to measure time.
 - 1.2.2.6 Identify common tools to measure length.
 - 1.2.2.7 Identify common tools to measure weight or mass.
 - 1.2.2.8 Identify common tools to measure volume.
 - 1.2.2.9 Identify common tools to measure temperature.
 - 1.2.2.10 Identify common tools to measure time.
 - 1.2.2.11 Use common tools to measure length.
 - 1.2.2.12 Use common tools to measure weight or mass.
 - 1.2.2.13 Use common tools to measure volume.
 - 1.2.2.14 Use common tools to measure temperature.
 - 1.2.2.15 Use common tools to measure time.

Expanded Benchmarks

- 1.2.3 Record the results of scientific investigations.
 - 1.2.3.1 Attend to the results of an investigation.
 - 1.2.3.2 Identify the results of an investigation.
 - 1.2.3.3 Record investigation results.

Expanded Benchmarks

1.2.4 Describe the results.

1.2.4.1 Respond to questions about the results.

1.2.4.2 Answer questions about the results.

1.4 Use models that illustrate simple concepts.

Expanded Benchmarks

1.4.1 Use models that illustrate simple concepts.

1.4.1.1 Attend to a basic model.

1.4.1.2 Recognize a basic model.

1.4.1.3 Identify a basic model.

1.4.1.4 Respond to a question about a basic model.

1.4.1.5 Answer a question about a basic model.

Benchmarks

Grade 8

Students will:

1.1 Identify a question, determine relevant variables, formulate a testable hypothesis, plan and predict the outcome of an investigation, safely conduct scientific investigations, and compare and analyze data.

Expanded Benchmarks

1.1.1 Understand the question, variables, and hypothesis when provided with an investigation.

1.1.1.1 Attend to a scientific question.

1.1.1.2 Attend to things that change.

1.1.1.3 Attend to things that stay the same.

1.1.1.4 Attend to a guess or prediction.

1.1.1.5 Identify a scientific question.

1.1.1.6 Identify things that change.

1.1.1.7 Identify things that stay the same.

1.1.1.8 Identify a guess or prediction.

1.1.1.9 Ask a question.

1.1.1.10 Given an investigation, make a prediction about the outcome.

1.1.1.11 Given an investigation, identify the question that is being examined.

1.1.1.12 Given an investigation, identify the things that change in the investigation.

1.1.1.13 Given an investigation, identify the things that stay the same in the investigation.

Expanded Benchmarks

1.1.2 Conduct a safe investigation when given step-by-step instructions.

1.1.2.1 Attend to the tools and resources needed for the investigation.
(Note: Tools are placed on the table.)

1.1.2.2 Identify the tools and resources needed for the investigation.

- (Note: Tools are placed on the table.)
- 1.1.2.3 Gather the tools needed for the investigation.
 - (Note: Tools are placed on the table.)
 - 1.1.2.4 Attend to the steps of the investigation.
 - 1.1.2.5 Identify the steps of the investigation.
 - 1.1.2.6 Implement each step as directed.
 - 1.1.2.7 Attend to the results of the investigation.
 - 1.1.2.8 Identify the results of the investigation.

1.2 Select and use appropriate tools.

Expanded Benchmarks

- 1.2.1 Use tools to investigate.
 - 1.2.1.1 Attend to tools that enlarge (ex. magnifier).
 - 1.2.1.2 Attend to tools that make sounds (ex. drums).
 - 1.2.1.3 Attend to tools that make sounds louder (ex. amplifier).
 - 1.2.1.4 Identify tools that enlarge (ex. magnifier).
 - 1.2.1.5 Identify tools that make sounds (ex. drums).
 - 1.2.1.6 Identify tools that make sounds louder (ex. amplifier).
 - 1.2.1.7 Use tools that enlarge if appropriate for the student.
 - 1.2.1.8 Use tools that make sounds.
 - 1.2.1.9 Use tools that make sounds louder.

Expanded Benchmarks

- 1.2.2 Use tools to make measurements.
 - 1.2.2.1 Attend to common tools that measure length.
 - 1.2.2.2 Attend to common tools that measure weight.
 - 1.2.2.3 Attend to common tools that measure volume.
 - 1.2.2.4 Attend to common tools to measure temperature.
 - 1.2.2.5 Attend to common tools to measure time.
 - 1.2.2.6 Identify common tools that measure length.
 - 1.2.2.7 Identify common tools that measure weight or mass.
 - 1.2.2.8 Identify common tools that measure volume.
 - 1.2.2.9 Identify common tools to measure temperature.
 - 1.2.2.10 Identify common tools to measure time.
 - 1.2.2.11 Use common tools to measure length.
 - 1.2.2.12 Use common tools to measure weight or mass.
 - 1.2.2.13 Use common tools to measure volume.
 - 1.2.2.14 Use common tools to measure temperature.
 - 1.2.2.15 Use common tools to measure time.

Expanded Benchmarks

- 1.2.3 Record the results of scientific investigations.
 - 1.2.3.1 Attend to the results of an investigation.
 - 1.2.3.2 Identify the results of an investigation.
 - 1.2.3.3 Record investigation results.
 - 1.2.3.4 Record investigation results in a table that has been provided.

Expanded Benchmarks

1.2.4 Describe the results.

1.2.4.1 Respond to questions about the results.

1.2.4.2 Answer questions about the results.

1.3 Communicate the results of scientific investigations.

Expanded Benchmarks

1.3.1 Communicate the results of scientific investigations.

1.3.1.1 Indicate the results of an investigation to another person.

1.4 Use models that illustrate simple concepts.

Expanded Benchmarks

1.4.1 Use models that illustrate simple concepts.

1.4.1.1 Attend to a basic model.

1.4.1.2 Recognize a basic model.

1.4.1.3 Identify a basic model.

1.4.1.4 Respond to a question about a basic model.

1.4.1.5 Answer a question about a basic model.

Benchmarks

Grade 10

Students will:

1.1 Generate a question, identify dependent and independent variables, formulate testable, multiple hypotheses, plan an investigation, predict its outcome, safely conduct the scientific investigations, and collect and analyze data.

Expanded Benchmarks

1.1.1 Understand the question, variables, and hypothesis when provided with an investigation.

1.1.1.1 Attend to a scientific question.

1.1.1.2 Attend to things that change.

1.1.1.3 Attend to things that stay the same.

1.1.1.4 Attend to a guess or prediction.

1.1.1.5 Identify a scientific question.

1.1.1.6 Identify things that change.

1.1.1.7 Identify things that stay the same.

1.1.1.8 Identify a guess or prediction.

1.1.1.9 Ask a question.

1.1.1.10 Given an investigation, make a prediction about the outcome.

1.1.1.11 Given an investigation, identify the question that is being examined.

1.1.1.12 Given an investigation, identify the things that change in the investigation.

- 1.1.1.13 Given an investigation, identify the things that stay the same in the investigation.

Expanded Benchmarks

- 1.1.2 Conduct a safe investigation when given step-by-step instructions.
 - 1.1.2.1 Attend to the tools and resources needed for the investigation.
(Note: Tools are placed on the table.)
 - 1.1.2.2 Identify the tools and resources needed for the investigation.
(Note: Tools are placed on the table.)
 - 1.1.2.3 Gather the tools needed for the investigation.
(Note: Tools are placed on the table.)
 - 1.1.2.4 Attend to the steps of the investigation.
 - 1.1.2.5 Identify the steps of the investigation.
 - 1.1.2.6 Implement each step as directed.
 - 1.1.2.7 Attend to the results of the investigation.
 - 1.1.2.8 Identify the results of the investigation.

1.2 Select and use appropriate tools.

Expanded Benchmarks

- 1.2.1 Use tools to investigate.
 - 1.2.1.1 Attend to tools that enlarge (ex. magnifier).
 - 1.2.1.2 Attend to tools that make sounds (ex. drums).
 - 1.2.1.3 Attend to tools that make sounds louder (ex. amplifier).
 - 1.2.1.4 Identify tools that enlarge (ex. magnifier).
 - 1.2.1.5 Identify tools that make sounds (ex. drums).
 - 1.2.1.6 Identify tools that make sounds louder (ex. amplifier).
 - 1.2.1.7 Use tools that enlarge if appropriate for the student.
 - 1.2.1.8 Use tools that make sounds.
 - 1.2.1.9 Use tools that make sounds louder.

Expanded Benchmarks

- 1.2.2 Use tools to make measurements.
 - 1.2.2.1 Attend to common tools that measure length.
 - 1.2.2.2 Attend to common tools that measure weight.
 - 1.2.2.3 Attend to common tools that measure volume.
 - 1.2.2.4 Attend to common tools to measure temperature.
 - 1.2.2.5 Attend to common tools to measure time.
 - 1.2.2.6 Identify common tools that measure length.
 - 1.2.2.7 Identify common tools that measure weight or mass.
 - 1.2.2.8 Identify common tools that measure volume.
 - 1.2.2.9 Identify common tools to measure temperature.
 - 1.2.2.10 Identify common tools to measure time.
 - 1.2.2.11 Use common tools to measure length.
 - 1.2.2.12 Use common tools to measure weight or mass.
 - 1.2.2.13 Use common tools to measure volume.

- 1.2.2.14 Use common tools to measure temperature.
- 1.2.2.15 Use common tools to measure time.

Expanded Benchmarks

- 1.2.3 Record the results of scientific investigations.
 - 1.2.3.1 Attend to the results of an investigation.
 - 1.2.3.2 Identify the results of an investigation.
 - 1.2.3.3 Record investigation results.
 - 1.2.3.4 Record investigation results in a table that has been provided.

Expanded Benchmarks

- 1.2.4 Describe the results.
 - 1.2.4.1 Respond to questions about the results.
 - 1.2.4.2 Answer questions about the results.

1.3 Communicate the results of scientific investigations.

Expanded Benchmarks

- 1.3.1 Communicate the results of scientific investigations.
 - 1.3.1.1 Indicate the results of an investigation to another person.
 - 1.3.1.2 Describe the results of an investigation to another person.

1.4 Use models that illustrate simple concepts.

Expanded Benchmarks

- 1.4.1 Use models that illustrate simple concepts.
 - 1.4.1.1 Attend to a basic model.
 - 1.4.1.2 Recognize a basic model.
 - 1.4.1.3 Identify a basic model.
 - 1.4.1.4 Respond to a question about a basic model.
 - 1.4.1.5 Answer a question about a basic model.

MONTANA STANDARDS AND EXPANDED BENCHMARKS FOR SCIENCE

Science Content Standard 2

Students demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems, and demonstrate the thinking skills associated with this knowledge.

Essence of Standard 2:

Rationale

Matter exists in a variety of forms. All physical interactions involve changes in energy. Therefore, knowledge of matter and energy is essential to interpreting, explaining, predicting, and influencing change in our world.

Benchmarks

Grade 4

Students will:

2.1 Create mixtures and separate them based on different physical properties. (e.g., salt and sand, iron filings and soil, oil and water)

Expanded Benchmarks

2.1.1 Create mixtures with common objects or substances.

2.1.1.1 Attend to common substances or objects.

2.1.1.2 Recognize common substances or objects.

2.1.1.3 Identify substances or objects that are the same.

2.1.1.4 Identify substances or objects that are different.

2.1.1.5 Mix common substances or objects.

2.1.1.6 Attend to a mixture.

2.1.1.7 Recognize a mixture.

Expanded Benchmarks

2.1.2 Separate mixtures using the physical properties of the common objects or substances they contain.

2.1.2.1 Attend to the different components of a mixture.

2.1.2.2 Recognize the different components of a mixture.

2.1.2.3 Identify the different components of a mixture.

2.1.2.4 Separate components of a mixture given instructions.

2.1.2.5 Identify how a given mixture can be separated.

2.2 Examine, describe, compare, and classify objects in terms of common physical properties.

Expanded Benchmarks

2.2.1 Examine common objects or substances with given physical properties.

2.2.1.1 Attend to common objects or substances.

- 2.2.1.2 Identify size of an object using qualitative language. (i.e. large, small)
- 2.2.1.3 Identify relative weight (mass) of an object. (i.e. heavier, lighter)
- 2.2.1.4 Identify objects with a given simple shape.
- 2.2.1.5 Identify objects with a given color.
- 2.2.1.6 Measure the length or width of an object using a ruler.
- 2.2.1.7 Measure the weight (mass) of an object using a scale or balance.

Expanded Benchmarks

- 2.2.2 Compare the common physical properties of two objects.
 - 2.2.2.1 Identify the similarities and differences in the size of two objects or substances.
 - 2.2.2.2 Identify the similarities and differences in the weight (mass) of two objects or substances.
 - 2.2.2.3 Identify the similarities and differences in the textures of two objects or substances.
 - 2.2.2.4 Describe the similarities and differences in the size of two objects or substances.
 - 2.2.2.5 Describe the similarities and differences in the weight of two objects or substances.
 - 2.2.2.6 Describe the similarities and differences in the textures of two objects or substances.

Expanded Benchmarks

- 2.2.3 Describe the common physical properties of objects.
 - 2.2.3.1 Describe the size of objects qualitatively. (big, little)
 - 2.2.3.2 Describe the weight (mass) of objects qualitatively. (heavy, light)
 - 2.2.3.3 Describe the textures of objects. (smooth, rough)

Expanded Benchmarks

- 2.2.4 Classify objects using their physical properties.
 - 2.2.4.1 Sort objects into three size categories. (big, medium, little)
 - 2.2.4.2 Sort objects into two weight categories. (heavy, light)
 - 2.2.4.3 Sort objects into two categories according to texture.

2.3 Identify the basic characteristics of light, heat, motion, magnetism, electricity and sound.

Expanded Benchmarks

- 2.3.1 Identify the basic characteristics of light.
 - 2.3.1.1 Attend to light
 - 2.3.1.2 Recognize light.
 - 2.3.1.3 Identify light.
 - 2.3.1.4 Attend to a mirror and/or lens.
 - 2.3.1.5 Recognize a mirror.
 - 2.3.1.6 Identify a mirror.
 - 2.3.1.7 Recognize a lens.
 - 2.3.1.8 Identify a lens.

- 2.3.1.9 Recognize that light travels in a straight line until it contacts a lens and bends (refraction).
- 2.3.1.10 Recognize that light travels in a straight line then returns when it contacts a mirror. (reflection)

Expanded Benchmarks

2.3.2 Identify the basic characteristics of heat. (note: students at this age cannot differentiate between heat and temperature, therefore understandings should be focused on temperature differences)

- 2.3.2.1 Attend to temperature changes (heat) being produced by rubbing.
- 2.3.2.2 Attend to temperature changes (heat) being produced by a heat source (e.g. burner, fire).
- 2.3.2.3 Recognize that temperature changes (heat) can be produced by rubbing.
- 2.3.2.4 Recognize that temperature changes (heat) can be produced by a heat source (e.g. burner, fire).
- 2.3.2.5 Recognize that temperature changes (heat) can move from one object to another.
- 2.3.2.6 Identify that temperature changes (heat) can be produced by rubbing.
- 2.3.2.7 Identify that temperature changes (heat) can be produced by a heat source (e.g. burner, fire).
- 2.3.2.8 Identify that temperature changes (heat) can move from one object to another.
- 2.3.2.9 Show that temperature changes (heat) can be produced by rubbing.
- 2.3.2.10 Show that temperature changes (heat) are produced when something is heated by a heat source.
- 2.3.2.11 Show that temperature changes (heat) can move from one object to another.

Expanded Benchmarks

2.3.3 Identify the basic characteristics of magnetism.

- 2.3.3.1 Attend to a magnet.
- 2.3.3.2 Recognize a magnet.
- 2.3.3.3 Identify a magnet.
- 2.3.3.4 Attend to a magnet attracting an object or repelling another magnet.
- 2.3.3.5 Use a magnet to attract objects.
- 2.3.3.6 Use a magnet to repel other magnets.
- 2.3.3.7 Demonstrate that some objects are attracted or repelled by magnets, and some objects are not affected by magnets.

Expanded Benchmarks

2.3.4 Identify the basic characteristics of motion.

- 2.3.4.1 Attend to something moving.
- 2.3.4.2 Recognize something moving.
- 2.3.4.3 Identify when something is moving or not moving.
- 2.3.4.4 Imitate an object's motion by tracing its position over time.
- 2.3.4.5 Recognize that motion is caused by outside forces. (e.g. a push)

causes something to move)

Expanded Benchmarks

2.3.5 Identify the basic characteristics of electricity.

- 2.3.5.1 Attend to a circuit with a light bulb, switch, wire, and battery.
- 2.3.5.2 Recognize a circuit with a light bulb, switch, wire, and battery.
- 2.3.5.3 Identify a circuit with a light bulb, switch, wire, and battery.
- 2.3.5.4 Identify the switch in the circuit.
- 2.3.5.5 Identify the light bulb in the circuit.
- 2.3.5.6 Operate the switch in the circuit. (This can be done by gesturing to another person to flip the switch.)
- 2.3.5.7 Recognize electricity as the reason the light bulb can be turned off or on.

Expanded Benchmarks

2.3.6 Identify the basic characteristics of sound.

- 2.3.6.1 Attend to sounds. (This can be done for deaf students by having them feel the vibrations of a drum.)
- 2.3.6.2 Recognize a sound and its source.
- 2.3.6.3 Identify a sound and its source.
- 2.3.6.4 Produce sounds from different objects and simple instruments.

2.4 Model and explain that matter exists as solids, liquids, and gases and can change from one form to another.

Expanded Benchmarks

2.4.1 Identify that matter changes form as it is heated or cooled.

- 2.4.1.1 Attend to matter changing state when heated or cooled.
- 2.4.1.2 Recognize that matter changes from solid to liquid to gas as temperature increases or from gas to liquid to solid as temperature decreases.
- 2.4.1.3 Identify the changes in matter, from solid to liquid to gas as temperature increases or from gas to liquid to solid as temperature decreases.

Expanded Benchmarks

2.4.2 Identify that matter can be solid, liquid, or gas.

- 2.4.2.1 Attend to examples of solids, liquids, and gases.
- 2.4.2.2 Between two samples, identify which is solid, liquid, or gas.
- 2.4.2.3 Sort samples into solid, liquid, and gas categories.
- 2.4.2.4 Provide an example of a solid, liquid, or gas.

Expanded Benchmarks

2.4.3 Recognize that energy can change forms.

- 2.4.3.1 Recognize chemical energy changing to heat energy. (safe, simple chemical reaction producing heat)
- 2.4.3.2 Recognize mechanical energy changing to heat energy. (frictional heat)

2.4.3.3 Recognize electrical energy changing to heat energy. (light bulb)

2.5 Identify that the position of an object can be described by its location relative to another object and its motions described, and measured by external forces action upon it.

Expanded Benchmarks

2.5.1 Recognize that when energy increases in one place, it decreases in another place.

2.5.1.1 Recognize that a push causes a toy car to move. (cause/effect)

2.5.1.2 Recognize that a toy car slows down as friction is produced.

2.6 Identify, build, and describe mechanical systems. (e.g., identify the forces acting within those systems)

Expanded Benchmarks

2.6.1 Identify simple machines.

2.6.1.1 Attend to an inclined plane.

2.6.1.2 Attend to a wheel and axle.

2.6.1.3 Attend to a wedge.

2.6.1.4 Attend to a lever.

2.6.1.5 Attend to a pulley.

2.6.1.6 Attend to a screw.

2.6.1.7 Recognize an inclined plane.

2.6.1.8 Recognize a wheel and axle.

2.6.1.9 Recognize a wedge.

2.6.1.10 Recognize a lever.

2.6.1.11 Recognize a pulley.

2.6.1.12 Recognize a screw.

2.6.1.13 Identify an inclined plane.

2.6.1.14 Identify a wheel and axle.

2.6.1.15 Identify a wedge.

2.6.1.16 Identify a lever.

2.6.1.17 Identify a pulley.

2.6.1.18 Identify a screw.

Expanded Benchmarks

2.6.2 Build and/or use a simple mechanical system.

2.6.2.1 Use a wedge. (e.g. a nail)

2.6.2.2 Use a screw.

2.6.2.3 Use a pulley.

2.6.2.4 Build and/or use an inclined plane.

2.6.2.5 Build and/or use a lever.

2.6.2.6 Build and/or use a wheel and axle.

Expanded Benchmarks

2.6.3 Identify forces acting in mechanical systems.

2.6.3.1 Recognize a force as a push or pull.

2.6.3.2 Identify a force as a push or pull.

- 2.6.3.3 Recognize that something changes when there is a push or pull.
- 2.6.3.4 Recognize that tasks are made easier with simple machines.

2.7 Use classification schemes to order objects.

Expanded Benchmarks

- 2.7.1 Use one physical property to classify simple objects into two groups.
 - 2.7.1.1 Sort objects according to size.
 - 2.7.1.2 Sort objects according to color.
 - 2.7.1.3 Sort objects according to weight.

Benchmarks

Grade 8

Students will:

2.1 Create mixtures and separate them based on different physical properties. (e.g., salt and sand, iron filings and soil, oil and water)

Expanded Benchmarks

- 2.1.1 Create mixtures with common objects or substances.
 - 2.1.1.1 Attend to common substances or objects.
 - 2.1.1.2 Recognize common substances or objects.
 - 2.1.1.3 Identify substances or objects that are the same.
 - 2.1.1.4 Identify substances or objects that are different.
 - 2.1.1.5 Mix common substances or objects.
 - 2.1.1.6 Attend to a mixture.
 - 2.1.1.7 Recognize a mixture.
 - 2.1.1.8 Recognize how the substances or objects making up the mixture and the mixture itself are different.
 - 2.1.1.9 Identify how the substances or objects making up the mixture and the mixture itself are different.

Expanded Benchmarks

- 2.1.2 Separate mixtures using the physical properties of the common objects or substances they contain.
 - 2.1.2.1 Attend to the different components of a mixture.
 - 2.1.2.2 Recognize the different components of a mixture.
 - 2.1.2.3 Identify the different components of a mixture.
 - 2.1.2.4 Separate components of a mixture given instructions.
 - 2.1.2.5 Identify how a given mixture can be separated.
 - 2.1.2.6 Separate components of a mixture using student-identified way.

2.1a Classify, describe, and manipulate physical models of matter in terms of: elements and compounds, pure substances and mixtures, atoms, and molecules.

Expanded Benchmarks

2.1.3 Classify, describe, and manipulate physical models of elements.

2.1.3.1 Attend to a physical model of an element.

2.1.3.2 Recognize that the model represents an element.

2.1.3.3 Sort models of elements according to their similarities and differences.

Expanded Benchmarks

2.1.4 Classify, describe, and manipulate physical models of compounds.

2.1.4.1 Attend to a physical model of a compound.

2.1.4.2 Recognize that the model represents a compound.

2.1.4.3 Sort models of compounds according to their similarities and differences.

Expanded Benchmarks

2.1.5 Classify, describe, and manipulate physical models of pure substances.

2.1.5.1 Attend to a physical model of a pure substance.

2.1.5.2 Recognize that the model represents a pure substance.

2.1.5.3 Sort models of pure substances according to their similarities and differences.

Expanded Benchmarks

2.1.6 Classify, describe, and manipulate physical models of mixtures.

2.1.6.1 Sort mixtures according to their similarities and differences.

2.1.6.2 Attend to a physical model of a mixture.

2.1.6.3 Recognize that the model represents a mixture.

2.1.6.4 Sort models of mixtures.

Expanded Benchmarks

2.1.7 Classify, describe, and manipulate physical models of atoms.

2.1.7.1 Attend to a physical model of an atom.

2.1.7.2 Recognize that the model represents an atom.

2.1.7.3 Sort models of atoms according to their similarities and differences.

Expanded Benchmarks

2.1.8 Classify, describe, and manipulate physical models of molecules.

2.1.8.1 Attend to a physical model of an element.

2.1.8.2 Recognize that the model represents an element.

2.1.8.3 Sort models of elements according to their similarities and differences.

2.2 Examine, describe, compare, and classify objects and substances based on common physical properties and simple chemical properties.

Expanded Benchmarks

2.2.1 Examine and identify common objects or substances with given physical properties.

2.2.1.1 Attend to common objects or substances.

2.2.1.2 Identify size of an object using qualitative and quantitative language. (i.e. large, small, twice as big)

2.2.1.3 Identify relative weight (mass) of an object. (i.e. heavier, lighter)

2.2.1.4 Identify objects with a given simple shape and identify the shape of simple objects.

2.2.1.5 Identify objects with a given color and identify the color of simple objects.

2.2.1.6 Measure the length or width of an object using a ruler.

2.2.1.7 Measure the weight (mass) of an object using a scale or balance.

Expanded Benchmarks

2.2.2 Compare the common physical properties of two to five objects.

2.2.2.1 Identify the similarities and differences in the size of two to five objects or substances.

2.2.2.2 Identify the similarities and differences in the weight (mass) of two to five objects or substances.

2.2.2.3 Identify the similarities and differences in the textures of two to five objects or substances.

2.2.2.4 Describe the similarities and differences in the size of two to five objects or substances.

2.2.2.5 Describe the similarities and differences in the weight of two to five objects or substances.

2.2.2.6 Describe the similarities and differences in the textures of two to five objects or substances.

Expanded Benchmarks

2.2.3 Describe the common physical properties of objects.

2.2.3.1 Describe the size of objects qualitatively and quantitatively. (big, little)

2.2.3.2 Describe the weight (mass) of objects qualitatively and quantitatively. (heavy, light, twice as heavy)

2.2.3.3 Describe the textures of objects. (smooth, rough)

Expanded Benchmarks

2.2.4 Classify objects using their physical properties.

2.2.4.1 Sort objects into three size categories. (big, medium, little)

2.2.4.2 Sort objects into two to three weight categories. (heavy, medium weight, light)

2.2.4.3 Sort objects into two to three categories according to texture.

Expanded Benchmarks

2.2.5 Examine and identify simple chemical properties of substances.

2.2.5.1 Attend to a chemical reaction between two substances.

2.2.5.2 Recognize a chemical reaction between two substances.

2.2.5.3 Identify a chemical reaction between two substances.

2.3 Describe energy and compare and contrast the characteristics of light, heat, motion, magnetism, electricity, sound and mechanical waves.

Expanded Benchmarks

2.3.1 Identify the basic characteristics of light.

2.3.1.1 Attend to light

2.3.1.2 Recognize light.

2.3.1.3 Identify light.

2.3.1.4 Attend to a mirror and/or lens.

2.3.1.5 Recognize a mirror.

2.3.1.6 Identify a mirror.

2.3.1.7 Recognize a lens.

2.3.1.8 Identify a lens.

2.3.1.9 Recognize that light travels in a straight line until it contacts a lens and bends (refraction).

2.3.1.10 Recognize that light travels in a straight line then returns when it contacts a mirror (reflection).

2.3.1.11 Indicate light being reflected or refracted.

2.3.1.12 Identify that light travels in a straight line until it strikes an object.

2.3.1.13 Identify when light is reflected or refracted.

2.3.1.14 Identify that mirrors send light back to where it came from.

2.3.1.15 Indicate that lenses bend light.

2.3.1.16 Recognize that light can be absorbed by an object.

2.3.1.17 Indicate that light can be absorbed by an object.

Expanded Benchmarks

2.3.2 Identify the basic characteristics of heat. (note: students may not be able to differentiate between heat and temperature, therefore understandings should be focused on temperature differences)

2.3.2.1 Attend to temperature changes (heat) being produced by rubbing.

2.3.2.2 Attend to heat being produced by a heat source (e.g. burner, fire).

2.3.2.3 Recognize that temperature changes (heat) can be produced by rubbing.

2.3.2.4 Recognize that temperature changes (heat) can be produced by a heat source (e.g. burner, fire).

2.3.2.5 Recognize that temperature changes (heat) can move from one object to another.

2.3.2.6 Identify that heat can be produced by rubbing.

2.3.2.7 Identify that temperature changes (heat) can be produced by a heat source (e.g. burner, fire).

- 2.3.2.8 Identify that temperature changes (heat) can move from one object to another.
- 2.3.2.9 Show that temperature changes (heat) can be produced by rubbing.
- 2.3.2.10 Show that temperature changes (heat) are produced when something is heated by a heat source.
- 2.3.2.11 Show that temperature changes (heat) can move from one object to another.

Expanded Benchmarks

- 2.3.3 Identify the basic characteristics of magnetism.
 - 2.3.3.1 Attend to a magnet.
 - 2.3.3.2 Recognize a magnet.
 - 2.3.3.3 Identify a magnet.
 - 2.3.3.4 Attend to a magnet attracting an object or repelling another magnet.
 - 2.3.3.5 Use a magnet to attract objects.
 - 2.3.3.6 Use a magnet to repel other magnets.
 - 2.3.3.7 Demonstrate that some objects are attracted or repelled by magnets, and some objects are not affected by magnets.

Expanded Benchmarks

- 2.3.4 Identify the basic characteristics of motion.
 - 2.3.4.1 Attend to something moving.
 - 2.3.4.2 Recognize something moving.
 - 2.3.4.3 Identify when something is moving or not moving.
 - 2.3.4.4 Imitate an object's motion by tracing its position over time.
 - 2.3.4.5 Recognize that motion is caused by outside forces. (e.g. a push causes something to move)

Expanded Benchmarks

- 2.3.5 Identify the basic characteristics of electricity.
 - 2.3.5.1 Attend to a circuit with a light bulb, switch, wire, and battery.
 - 2.3.5.2 Recognize a circuit with a light bulb, switch, wire, and battery.
 - 2.3.5.3 Identify a circuit with a light bulb, switch, wire, and battery.
 - 2.3.5.4 Identify the switch in the circuit.
 - 2.3.5.5 Identify the light bulb in the circuit.
 - 2.3.5.6 Operate the switch in the circuit. (This can be done by gesturing to another person to flip the switch.)
 - 2.3.5.7 Recognize electricity as the reason the light bulb can be turned off or on.

Expanded Benchmarks

- 2.3.6 Identify the basic characteristics of sound.
 - 2.3.6.1 Attend to sounds. (This can be done for deaf students by having them feel the vibrations of a drum.)
 - 2.3.6.2 Recognize a sound and its source.
 - 2.3.6.3 Identify a sound and its source.
 - 2.3.6.4 Produce sounds from different objects and simple instruments.

2.4 Model and explain that states of matter are dependent upon the quantity of energy present in the system and describe what will change and what will remain unchanged at the particulate level when matter experiences an external force or energy change.

Expanded Benchmarks

- 2.4.1 Identify that matter changes form as it is heated or cooled.
 - 2.4.1.1 Attend to matter changing state when heated or cooled.
 - 2.4.1.2 Recognize that matter changes from solid to liquid to gas as temperature increases or from gas to liquid to solid as temperature decreases.
 - 2.4.1.3 Identify the changes in matter, from solid to liquid to gas as temperature increases or from gas to liquid to solid as temperature decreases.

Expanded Benchmarks

- 2.4.2 Identify that matter can be solid, liquid, or gas depending on the quantity of energy present in the system.
 - 2.4.2.1 Attend to examples of solids, liquids, and gases.
 - 2.4.2.2 Between two to three samples, identify which is solid, liquid, or gas.
 - 2.4.2.3 Sort samples into solid, liquid, and gas categories.
 - 2.4.2.4 Provide an example of a solid, liquid, or gas.
 - 2.4.2.5 Identify that matter has a temperature (energy).
 - 2.4.2.6 Recognize that the energy in matter increases as it changes from solid to liquid to gas.
 - 2.4.2.7 Identify that the energy in matter increases as it changes from solid to liquid to gas.

Expanded Benchmarks

- 2.4.3 Recognize that energy can change forms.
 - 2.4.3.1 Recognize chemical energy changing to heat energy. (safe, simple chemical reaction producing heat)
 - 2.4.3.2 Recognize mechanical energy changing to heat energy. (frictional heat)
 - 2.4.3.3 Recognize electrical energy changing to heat energy. (light bulb)

2.5 Describe and explain the motion of an object in terms of its position, direction, & speed as well as the forces acting upon it.

Expanded Benchmarks

- 2.5.1 Recognize that when energy increases in one place, it decreases in another place.
 - 2.5.1.1 Recognize that a push causes an object to move. (cause/effect)
 - 2.5.1.2 Recognize that an object slows down as friction is produced.

2.6 Identify, build, describe, measure, and analyze mechanical systems (e.g., simple and complex machines) and describe the forces acting within those systems.

Expanded Benchmarks

2.6.1 Identify simple machines.

- 2.6.1.1 Attend to an inclined plane.
- 2.6.1.2 Attend to a wheel and axle.
- 2.6.1.3 Attend to a wedge.
- 2.6.1.4 Attend to a lever.
- 2.6.1.5 Attend to a pulley.
- 2.6.1.6 Attend to a screw.
- 2.6.1.7 Recognize an inclined plane.
- 2.6.1.8 Recognize a wheel and axle.
- 2.6.1.9 Recognize a wedge.
- 2.6.1.10 Recognize a lever.
- 2.6.1.11 Recognize a pulley.
- 2.6.1.12 Recognize a screw.
- 2.6.1.13 Identify an inclined plane.
- 2.6.1.14 Identify a wheel and axle.
- 2.6.1.15 Identify a wedge.
- 2.6.1.16 Identify a lever.
- 2.6.1.17 Identify a pulley.
- 2.6.1.18 Identify a screw.
- 2.6.1.19 Recognize that tasks are made easier with simple machines.
- 2.6.1.20 Demonstrate that tasks are made easier with simple machines.

Expanded Benchmarks

2.6.2 Build and/or use a simple mechanical system.

- 2.6.2.1 Use a wedge. (e.g. a nail)
- 2.6.2.2 Use a screw.
- 2.6.2.3 Use a pulley.
- 2.6.2.4 Build and/or use an inclined plane.
- 2.6.2.5 Build and/or use a lever.
- 2.6.2.6 Build and/or use a wheel and axle.

Expanded Benchmarks

2.6.3 Identify forces acting in mechanical systems.

- 2.6.3.1 Recognize a force as a push or pull.
- 2.6.3.2 Identify a force as a push or pull.
- 2.6.3.3 Recognize that something changes when there is a push or pull.
- 2.6.3.4 Recognize that tasks are made easier with simple machines.
- 2.6.3.5 Demonstrate that tasks are made easier with simple machines.

Expanded Benchmarks

2.6.4 Identify the simple machines that make up a complex machine.

2.6.4.1 Recognize that many machines are made from more than one simple machine.

2.6.4.2 Recognize the simple machines in a complex machine.

2.6.4.3 Identify the simple machines in a complex machine.

2.7 Use classification schemes to order objects.

Expanded Benchmarks

2.7.1 Use one physical property to classify simple objects into two or three groups.

2.7.1.1 Sort objects according to size.

2.7.1.2 Sort objects according to color.

2.7.1.3 Sort objects according to weight.

Expanded Benchmarks

2.7.2 Use two physical properties to classify simple objects into two groups.

2.7.2.1 Classify objects according to size and color into two groups.

2.7.2.2 Classify objects according to size and weight (or mass or density) into two groups.

2.7.2.3 Indicate how the objects were classified. (which physical properties were used)

Expanded Benchmarks

2.7.3 Analyze data in simple scientific contexts. (e.g., density)

2.7.3.1 Recognize data as information about something.

2.7.3.2 Classify data from simple scientific procedures.

2.7.3.3 Analyze data from simple scientific procedures.

Benchmarks

Grade 10

Students will:

2.1 Create mixtures and separate them based on different physical properties. (e.g., salt and sand, iron filings and soil, oil and water)

Expanded Benchmarks

2.1.1 Create mixtures with common objects or substances.

2.1.1.1 Attend to common substances or objects.

2.1.1.2 Recognize common substances or objects.

2.1.1.3 Identify substances or objects that are the same.

2.1.1.4 Identify substances or objects that are different.

2.1.1.5 Mix common substances or objects.

2.1.1.6 Attend to a mixture.

2.1.1.7 Recognize a mixture.

- 2.1.1.8 Recognize how the substances or objects making up the mixture and the mixture itself are different.
- 2.1.1.9 Identify how the substances or objects making up the mixture and the mixture itself are different.

Expanded Benchmarks

2.1.2 Separate mixtures using the physical properties of the common objects or substances they contain.

- 2.1.2.1 Attend to the different components of a mixture.
- 2.1.2.2 Recognize the different components of a mixture.
- 2.1.2.3 Identify the different components of a mixture.
- 2.1.2.4 Separate components of a mixture given instructions.
- 2.1.2.5 Identify how a given mixture can be separated.
- 2.1.2.6 Separate components of a mixture using student-identified way.

2.1a Classify, describe, and manipulate physical models of matter in terms of: elements and compounds, pure substances and mixtures, atoms, and molecules.

Expanded Benchmarks

2.1.3 Classify, describe, and manipulate physical models of elements.

- 2.1.3.1 Attend to a physical model of an element.
- 2.1.3.2 Recognize that the model represents an element.
- 2.1.3.3 Sort models of elements according to their similarities and differences.
- 2.1.3.4 Identify that the model represents an element.
- 2.1.3.5 Describe the model as representing an element.

Expanded Benchmarks

2.1.4 Classify, describe, and manipulate physical models of compounds.

- 2.1.4.1 Attend to a physical model of a compound.
- 2.1.4.2 Recognize that the model represents a compound.
- 2.1.4.3 Sort models of compounds according to their similarities and differences.
- 2.1.4.4 Identify that the model represents a compound.
- 2.1.4.5 Describe the model as representing a compound.

Expanded Benchmarks

2.1.5 Classify, describe, and manipulate physical models of pure substances.

- 2.1.5.1 Attend to a physical model of a pure substance.
- 2.1.5.2 Recognize that the model represents a pure substance.
- 2.1.5.3 Sort models of pure substances according to their similarities and differences.
- 2.1.5.4 Identify that the model represents a pure substance.
- 2.1.5.5 Describe the model as representing a pure substance.

Expanded Benchmarks

2.1.6 Classify, describe, and manipulate physical models of mixtures.

- 2.1.6.1 Attend to a mixture.

- 2.1.6.2 Recognize a mixture.
- 2.1.6.3 Sort mixtures according to their similarities and differences.
- 2.1.6.4 Attend to a physical model of a mixture.
- 2.1.6.5 Recognize that the model represents a mixture.
- 2.1.6.6 Sort models of mixtures.
- 2.1.6.7 Identify that the model represents a mixture.
- 2.1.6.8 Describe the model as representing a mixture.

Expanded Benchmarks

- 2.1.7 Classify, describe, and manipulate physical models of atoms.
 - 2.1.7.1 Attend to a physical model of an atom.
 - 2.1.7.2 Recognize that the model represents an atom.
 - 2.1.7.3 Sort models of atoms according to their similarities and differences.
 - 2.1.7.4 Identify that the model represents an atom.
 - 2.1.7.5 Describe the model as representing an atom.

Expanded Benchmarks

- 2.1.8 Classify, describe, and manipulate physical models of molecules.
 - 2.1.8.1 Attend to a physical model of an element.
 - 2.1.8.2 Recognize that the model represents an element.
 - 2.1.8.3 Sort models of elements according to their similarities and differences.
 - 2.1.8.4 Identify that the model represents an element.
 - 2.1.8.5 Describe the model as representing an element.

2.2 Examine, describe, compare, and classify objects and substances based on common physical properties and simple chemical properties.

Expanded Benchmarks

- 2.2.1 Examine and identify common objects or substances with given physical properties.
 - 2.2.1.1 Attend to common objects or substances.
 - 2.2.1.2 Identify size of an object using qualitative and quantitative language. (i.e. large, small, twice as big)
 - 2.2.1.3 Identify relative weight (mass) of an object. (i.e. heavier, lighter)
 - 2.2.1.4 Identify objects with a given simple shape and identify the shape of simple objects.
 - 2.2.1.5 Identify objects with a given color and identify the color of simple objects.
 - 2.2.1.6 Measure the length or width of an object using a ruler.
 - 2.2.1.7 Measure the weight (mass) of an object using a scale or balance.

Expanded Benchmarks

- 2.2.2 Compare the common physical properties of two to seven objects.
 - 2.2.2.1 Identify the similarities and differences in the size of two to seven objects or substances.
 - 2.2.2.2 Identify the similarities and differences in the weight (mass) of two to seven objects or substances.

- 2.2.2.3 Identify the similarities and differences in the textures of two to seven objects or substances.
- 2.2.2.4 Describe the similarities and differences in the size of two to seven objects or substances.
- 2.2.2.5 Describe the similarities and differences in the weight of two to seven objects or substances.
- 2.2.2.6 Describe the similarities and differences in the textures of two to seven objects or substances.

Expanded Benchmarks

- 2.2.3 Describe the common physical properties of objects.
 - 2.2.3.1 Describe the size of objects qualitatively and quantitatively. (big, little)
 - 2.2.3.2 Describe the weight (mass) of objects qualitatively and quantitatively. (heavy, light, twice as heavy)
 - 2.2.3.3 Describe the textures of objects. (smooth, rough)

Expanded Benchmarks

- 2.2.4 Classify objects using their physical properties.
 - 2.2.4.1 Sort objects into two to three size categories. (big, medium, little)
 - 2.2.4.2 Sort objects into two to three weight categories. (heavy, medium weight, light)
 - 2.2.4.3 Sort objects into two to three categories according to texture.
- 2.2.5 Examine and identify simple chemical properties of substances.
 - 2.2.5.1 Attend to a chemical reaction between two substances.
 - 2.2.5.2 Recognize a chemical reaction between two substances.
 - 2.2.5.3 Identify a chemical reaction between two substances.

2.3 Describe energy and compare and contrast the characteristics of light, heat, motion, magnetism, electricity, sound and mechanical waves.

Expanded Benchmarks

- 2.3.1 Identify the basic characteristics of light.
 - 2.3.1.1 Attend to light
 - 2.3.1.2 Recognize light.
 - 2.3.1.3 Identify light.
 - 2.3.1.4 Attend to a mirror and/or lens.
 - 2.3.1.5 Recognize a mirror.
 - 2.3.1.6 Identify a mirror.
 - 2.3.1.7 Recognize a lens.
 - 2.3.1.8 Identify a lens.
 - 2.3.1.9 Recognize that light travels in a straight line until it contacts a lens and bends (refraction).
 - 2.3.1.10 Recognize that light travels in a straight line then returns when it contacts a mirror (reflection).
 - 2.3.1.11 Indicate light being reflected or refracted.
 - 2.3.1.12 Identify that light travels in a straight line until it strikes an object.

- 2.3.1.13 Identify when light is reflected or refracted.
- 2.3.1.14 Identify that mirrors send light back to where it came from.
- 2.3.1.15 Indicate that lenses bend light.
- 2.3.1.16 Recognize that light can be absorbed by an object.
- 2.3.1.17 Indicate that light can be absorbed by an object.

Expanded Benchmarks

2.3.2 Identify the basic characteristics of heat. (note: students may not be able to differentiate between heat and temperature, therefore understandings should be focused on temperature differences)

- 2.3.2.1 Attend to temperature changes (heat) being produced by rubbing.
- 2.3.2.2 Attend to temperature changes (heat) being produced by a heat source (e.g. burner, fire).
- 2.3.2.3 Recognize that temperature changes (heat) can be produced by rubbing.
- 2.3.2.4 Recognize that temperature changes (heat) can be produced by a heat source (e.g. burner, fire).
- 2.3.2.5 Recognize that temperature changes (heat) can move from one object to another.
- 2.3.2.6 Identify that temperature changes (heat) can be produced by rubbing.
- 2.3.2.7 Identify that temperature changes (heat) can be produced by a heat source (e.g. burner, fire).
- 2.3.2.8 Identify that temperature changes (heat) can move from one object to another.
- 2.3.2.9 Show that temperature changes (heat) can be produced by rubbing.
- 2.3.2.10 Show that temperature changes (heat) are produced when something is heated by a heat source.
- 2.3.2.11 Show that temperature changes (heat) can move from one object to another.

Expanded Benchmarks

2.3.3 Identify the basic characteristics of magnetism.

- 2.3.3.1 Attend to a magnet.
- 2.3.3.2 Recognize a magnet.
- 2.3.3.3 Identify a magnet.
- 2.3.3.4 Attend to a magnet attracting an object or repelling another magnet.
- 2.3.3.5 Use a magnet to attract objects.
- 2.3.3.6 Use a magnet to repel other magnets.
- 2.3.3.7 Demonstrate that some objects are attracted or repelled by magnets, and some objects are not affected by magnets.

Expanded Benchmarks

2.3.4 Identify the basic characteristics of motion.

- 2.3.4.1 Attend to something moving.
- 2.3.4.2 Recognize something moving.
- 2.3.4.3 Identify when something is moving or not moving.
- 2.3.4.4 Imitate an object's motion by tracing its position over time.

- 2.3.4.5 Recognize that motion is caused by outside forces. (e.g. a push causes something to move)

Expanded Benchmarks

- 2.3.5 Identify the basic characteristics of electricity.
 - 2.3.5.1 Attend to a circuit with a light bulb, switch, wire, and battery.
 - 2.3.5.2 Recognize a circuit with a light bulb, switch, wire, and battery.
 - 2.3.5.3 Identify a circuit with a light bulb, switch, wire, and battery.
 - 2.3.5.4 Identify the switch in the circuit.
 - 2.3.5.5 Identify the light bulb in the circuit.
 - 2.3.5.6 Operate the switch in the circuit. (This can be done by gesturing to another person to flip the switch.)
 - 2.3.5.7 Recognize electricity as the reason the light bulb can be turned off or on.

Expanded Benchmarks

- 2.3.6 Identify the basic characteristics of sound.
 - 2.3.6.1 Attend to sounds. (This can be done for deaf students by having them feel the vibrations of a drum.)
 - 2.3.6.2 Recognize a sound and its source.
 - 2.3.6.3 Identify a sound and its source.
 - 2.3.6.4 Produce sounds from different objects and simple instruments.

2.4 Model and explain that states of matter are dependent upon the quantity of energy present in the system and describe what will change and what will remain unchanged at the particulate level when matter experiences an external force or energy change.

Expanded Benchmarks

- 2.4.1 Identify that matter changes form as it is heated or cooled.
 - 2.4.1.1 Attend to matter changing state when heated or cooled.
 - 2.4.1.2 Recognize that matter changes from solid to liquid to gas as temperature increases or from gas to liquid to solid as temperature decreases.
 - 2.4.1.3 Identify the changes in matter, from solid to liquid to gas as temperature increases or from gas to liquid as temperature decreases.

Expanded Benchmarks

- 2.4.2 Identify that matter can be solid, liquid, or gas depending on the quantity of energy present in the system.
 - 2.4.2.1 Attend to examples of solids, liquids, and gases.
 - 2.4.2.2 Between two to three samples, identify which is solid, liquid, or gas.
 - 2.4.2.3 Sort samples into solid, liquid, and gas categories.
 - 2.4.2.4 Provide an example of a solid, liquid, or gas.
 - 2.4.2.5 Identify that matter has a temperature (energy).
 - 2.4.2.6 Recognize that the energy in matter increases as it changes from solid to liquid to gas.

- 2.4.2.7 Identify that the energy in matter increases as it changes from solid to liquid to gas.

Expanded Benchmarks

- 2.4.3 Recognize that energy can change forms.

- 2.4.3.1 Recognize chemical energy changing to heat energy. (safe, simple chemical reaction producing heat)
- 2.4.3.2 Recognize mechanical energy changing to heat energy. (frictional heat)
- 2.4.3.3 Recognize electrical energy changing to heat energy. (light bulb)

2.5 Explain the interactions between motions and forces, including (a) the laws of motion and (b) an understanding of the gravitational and electromagnetic forces.

Expanded Benchmarks

- 2.5.1 Recognize that when energy increases in one place, it decreases in another place.

- 2.5.1.1 Recognize that a push causes an object to move. (cause/effect)
- 2.5.1.2 Recognize that an object slows down as friction is produced.

2.6 Identify, build, describe, measure, and analyze mechanical systems (e.g., simple and complex machines) and describe the forces acting within those systems.

Expanded Benchmarks

- 2.6.1 Identify simple machines.

- 2.6.1.1 Attend to an inclined plane.
- 2.6.1.2 Attend to a wheel and axle.
- 2.6.1.3 Attend to a wedge.
- 2.6.1.4 Attend to a lever.
- 2.6.1.5 Attend to a pulley.
- 2.6.1.6 Attend to a screw.
- 2.6.1.7 Recognize an inclined plane.
- 2.6.1.8 Recognize a wheel and axle.
- 2.6.1.9 Recognize a wedge.
- 2.6.1.10 Recognize a lever.
- 2.6.1.11 Recognize a pulley.
- 2.6.1.12 Recognize a screw.
- 2.6.1.13 Identify an inclined plane.
- 2.6.1.14 Identify a wheel and axle.
- 2.6.1.15 Identify a wedge.
- 2.6.1.16 Identify a lever.
- 2.6.1.17 Identify a pulley.
- 2.6.1.18 Identify a screw.
- 2.6.1.19 Recognize that tasks are made easier with simple machines.
- 2.6.1.20 Demonstrate that tasks are made easier with simple machines.

Expanded Benchmarks

- 2.6.2 Build and/or use a simple mechanical system.

- 2.6.2.1 Use a wedge. (e.g. a nail)
- 2.6.2.2 Use a screw.
- 2.6.2.3 Use a pulley.
- 2.6.2.4 Build and/or use an inclined plane.
- 2.6.2.5 Build and/or use a lever.
- 2.6.2.6 Build and/or use a wheel and axle.

Expanded Benchmarks

- 2.6.3 Identify forces acting in mechanical systems.
 - 2.6.3.1 Recognize a force as a push or pull.
 - 2.6.3.2 Identify a force as a push or pull.
 - 2.6.3.3 Recognize that something changes when there is a push or pull.
 - 2.6.3.4 Recognize that tasks are made easier with simple machines.
 - 2.6.3.5 Demonstrate that tasks are made easier with simple machines.

Expanded Benchmarks

- 2.6.4 Identify the simple machines that make up a complex machine.
 - 2.6.4.1 Recognize that many machines are made from more than one simple machine.
 - 2.6.4.2 Recognize the simple machines in a complex machine.
 - 2.6.4.3 Identify the simple machines in a complex machine.

2.7 Use classification schemes to order objects.

Expanded Benchmarks

- 2.7.1 Use one physical property to classify simple objects into two to four groups.
 - 2.7.1.1 Sort objects according to size.
 - 2.7.1.2 Sort objects according to color.
 - 2.7.1.3 Sort objects according to weight.

Expanded Benchmarks

- 2.7.2 Use two physical properties to classify simple objects into two to three groups.
 - 2.7.2.1 Sort objects according to size and color into two groups.
 - 2.7.2.2 Sort objects according to size and weight (or mass or density) into two groups.
 - 2.7.2.3 Indicate how the objects were classified. (which physical properties were used)

Expanded Benchmarks

- 2.7.3 Analyze data in multiple scientific contexts of increasing complexity.
 - 2.7.3.1 Recognize data as information about something.
 - 2.7.3.2 Classify data from simple scientific procedures.
 - 2.7.3.3 Analyze data from simple scientific procedures.
 - 2.7.3.4 Classify data from multiple simple scientific procedures.
 - 2.7.3.5 Analyze data from multiple simple scientific procedures.
 - 2.7.3.6 Classify data from increasingly complex scientific procedures.

2.7.3.7 Analyze data from increasingly complex scientific procedures.

MONTANA STANDARDS AND EXPANDED BENCHMARKS FOR SCIENCE

Science Content Standard 3

Students demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment, and demonstrate the thinking skills associated with this knowledge.

Essence of Standard 3:

Rationale

Students gain a better understanding of the world around them if they study a variety of organisms, microscopic as well as macroscopic. Through the study of similarities and differences of organisms, students learn the importance of classification and the diversity of living organisms. The understanding of diversity helps students understand biological evolution and life's natural processes (e.g., cycles, growth, and reproduction). Structure, function, body organization, growth and development, and health and disease are important aspects to the study of life. The study of living systems provides students with important information about how humans critically impact Earth's biomes.

Benchmarks

Grade 4

Students will:

3.1 Identify that plants and animals have structures and systems, which serve different functions.

Expanded Benchmarks

3.1.1 Distinguish plants from animals.

3.1.1.1 Recognize plants.

3.1.1.2 Recognize animals.

3.1.1.3 When given a group of plants and animals, identify which individuals are plants or animals.

Expanded Benchmarks

3.1.2 Identify the structures and systems of animals.

3.1.2.1 Recognize arms, legs, heads, bodies, antennae, eyes, nose, mouths and tails of animals.

3.1.2.2 Identify arms, legs, heads, bodies, antennae, eyes, nose, mouths and tails of animals.

3.1.2.3 Recognize that animals eat plants or other animals using their mouths.

3.1.2.4 Identify the animal mouth as part of a system for obtaining nutrition.

3.1.2.5 Recognize that animals breathe with lungs or gills.

Expanded Benchmarks

3.1.3 Identify the structures and systems of plants.

- 3.1.3.1 Recognize seeds, roots, stems, leaves, and flowers of plants.
- 3.1.3.2 Identify roots as the plant part that takes in water from the soil.
- 3.1.3.3 Identify stems as the passageway through which water moves throughout the plant.

Expanded Benchmarks

3.1.4 Identify the functions of the structures and systems of animals.

- 3.1.4.1 Identify the lungs or gills as part of a system for obtaining oxygen.
- 3.1.4.2 Recognize that arms and legs are used for moving.
- 3.1.4.3 Recognize that eyes are used for seeing.
- 3.1.4.4 Recognize that noses are used for smelling.
- 3.1.4.5 Recognize that antennae are used for sensing.

Expanded Benchmarks

3.1.5 Identify the functions of the structures and systems of plants.

- 3.1.5.1 Identify the function of the seeds and flowers as making new plants.
- 3.1.5.2 Identify the function of the roots as bringing water into the plant.
- 3.1.5.3 Identify the function of the stem as a passageway for the transport of water.

3.2 Identify and describe basic requirements of energy needed and nutritional needs for each human body system.

Expanded Benchmarks

3.2.1 Describe that all human body systems need energy from food.

- 3.2.1.1 Recognize that all human body systems need energy from food.
- 3.2.1.2 Identify that all human body systems need energy from food.
- 3.2.1.3 Describe that all human body systems need energy from food.

Expanded Benchmarks

3.2.2 Recognize that respiration is a way to get energy for life processes.

- 3.2.2.1 Recognize breathing.
- 3.2.2.2 Recognize that respiration provides energy to the cells of the body.
- 3.2.2.3 Recognize that respiration occurs in all plants and animals.
- 3.2.2.4 Recognize that energy is needed by cells to carry on life processes.

Expanded Benchmarks

3.2.3 Identify that plants make their own food through photosynthesis.

- 3.2.3.1 Recognize that plants make their own food.

3.3 Describe models that trace the life cycles of different plants and animals and discuss how they differ from species to species.

Expanded Benchmarks

3.3.1 Identify three parts of the human life cycle.

- 3.3.1.1 Recognize a baby.
- 3.3.1.2 Recognize a child.
- 3.3.1.3 Recognize an adult.
- 3.3.1.4 Identify whether a person or representation of a person is a baby, child, or adult.
- 3.3.1.5 Sequence baby, child, and adult as the life cycle of a human.

Expanded Benchmarks

3.3.2 Identify the major parts of the life cycle of a flowering plant.

- 3.3.2.1 Recognize the seed.
- 3.3.2.2 Recognize a seed as beginning to grow when the root begins to appear.
- 3.3.2.3 Recognize a seedling as a young plant.
- 3.3.2.4 Recognize a mature plant that can produce a flower and pods or fruits.
- 3.3.2.5 Sequence seed, seedling, and mature plant as the life cycle of a flowering plant.

Expanded Benchmarks

3.3.3 Recognize the major parts of the frog life cycle.

- 3.3.3.1 Recognize an egg as the first stage.
- 3.3.3.2 Recognize a tadpole as the second stage.
- 3.3.3.3 Recognize a frog as the third stage.
- 3.3.3.4 Sequence egg, tadpole, and frog as the life cycle of a frog.

Expanded Benchmarks

3.3.4 Recognize the major parts of the butterfly life cycle.

- 3.3.4.1 Recognize an egg as the first stage.
- 3.3.4.2 Recognize a caterpillar as the second stage.
- 3.3.4.3 Recognize a chrysalis as the third stage.
- 3.3.4.4 Recognize a butterfly as the fourth stage.
- 3.3.4.5 Sequence egg, caterpillar, chrysalis, and butterfly as the life cycle of a butterfly.

3.4 Explain cause and effect relationships between nonliving and living components within ecosystems; and explain individual response to the changes in the environment.

Expanded Benchmarks

3.4.1 Distinguish between living and nonliving things.

- 3.4.1.1 Recognize which is living when given a choice between something that is living and something that is nonliving.
- 3.4.1.2 Identify which components in a group are living and which are nonliving.

3.4.1.3 Group components into living and nonliving groups.

Expanded Benchmarks

3.4.2 Describe parts of an ecosystem.

3.4.2.1 Identify nonliving and living parts of an ecosystem.

Expanded Benchmarks

3.4.3 Predict responses of organisms to changes in the environment.

3.4.3.1 Recognize that organisms change when something changes in their environment.

3.4.3.2 Identify organism responses to changes in their environment.

Expanded Benchmarks

3.4.4 Recognize that behaviors and characteristics are learned or inherited

3.4.4.1 Recognize that organisms look similar to their parents

3.4.4.2 Recognize that organisms have similar behaviors to their parents

3.5 Create and use a classification system to group a variety of plants and animals according to their similarities and differences, preferably using indigenous plants and animals.

Expanded Benchmarks

3.5.1 Sort plants and animals according to their similarities and differences.

3.5.1.1 Recognize similarities and differences between four plants and/or animals that are common locally.

3.5.1.2 Sort four animals and/or plants into two groups based on one or two similarities or differences.

Expanded Benchmark

3.5.2 Classify plants and animals according to their similarities or differences.

3.5.2.1 Recognize classification of plants and animals as sorting them according to their similarities or differences.

3.5.2.2 Identify classification of plants and animals as sorting them according to their similarities or differences.

3.5.2.3 Sort plants and/or animals according to their similarities or differences.

Benchmarks

Grade 8

Students will:

3.1 Identify that plants animals have structures and systems, which serve different functions.

Expanded Benchmarks

3.1.1 Distinguish plants from animals.

3.1.1.1 Recognize plants.

3.1.1.2 Recognize animals.

- 3.1.1.3 When given a group of plants and animals, identify which individuals are plants or animals.

Expanded Benchmarks

- 3.1.2 Identify the structures and systems of animals.
 - 3.1.2.1 Recognize arms, legs, heads, bodies, antennae, eyes, nose, mouths and tails of animals.
 - 3.1.2.2 Identify arms, legs, heads, bodies, antennae, eyes, nose, mouths and tails of animals.
 - 3.1.2.3 Recognize that animals eat plants or other animals using their mouths.
 - 3.1.2.4 Identify the animal mouth as part of a system for obtaining nutrition.
 - 3.1.2.5 Recognize that animals breathe with lungs or gills.

Expanded Benchmarks

- 3.1.3 Identify the structures and systems of plants.
 - 3.1.3.1 Recognize seeds, roots, stems, leaves, and flowers of plants.
 - 3.1.3.2 Identify roots as the plant part that takes in water from the soil.
 - 3.1.3.3 Identify stems as the passageway through which water moves throughout the plant.
 - 3.1.3.4 Identify seeds and flowers as part of the reproductive system of plants.
 - 3.1.3.5 Identify that plants take in carbon dioxide and give off oxygen.
 - 3.1.3.6 Identify that plants make their own food.

Expanded Benchmarks

- 3.1.4 Identify the functions of the structures and systems of animals.
 - 3.1.4.1 Identify the lungs or gills as part of a system for obtaining oxygen.
 - 3.1.4.2 Recognize that arms and legs are used for moving.
 - 3.1.4.3 Recognize that eyes are used for seeing.
 - 3.1.4.4 Recognize that noses are used for smelling.
 - 3.1.4.5 Recognize that antennae are used for sensing.

Expanded Benchmarks

- 3.1.5 Identify the functions of the structures and systems of plants.
 - 3.1.5.1 Identify the function of the seeds and flowers as making new plants.
 - 3.1.5.2 Identify the function of the roots as bringing water into the plant.
 - 3.1.5.3 Identify the function of the stem as a passageway for the transport of water.

3.1a Compare the structure and function of prokaryotic cells (bacteria) and eukaryotic cells (plant, animal, etc.).

Expanded Benchmarks

- 3.1.6 Identify bacteria/germs as an organism that can cause disease.
 - 3.1.6.1 Recognize bacteria/germs.
 - 3.1.6.2 Identify one or two places where bacteria/germs might be found.
 - 3.1.6.3 Identify that bacteria/germs cause some diseases.

Expanded Benchmarks

- 3.1.7 Compare plant cells and animal cells.
 - 3.1.7.1 Attend to cells
 - 3.1.7.2 Recognize a plant cell.
 - 3.1.7.3 Recognize an animal cell.

3.2 Explain how organisms and systems of organisms obtain and use energy resources to maintain stable conditions (e.g., photosynthesis, respiration).

Expanded Benchmarks

- 3.2.1 Describe that all animal body systems (including those of humans) need energy from food.
 - 3.2.1.1 Recognize that all animal body systems (including those of humans) need energy from food.
 - 3.2.1.2 Identify that all animal body systems (including those of humans) need energy from food.
 - 3.2.1.3 Describe that all animal body systems (including those of humans) need energy from food.

Expanded Benchmarks

- 3.2.2 Recognize that respiration is a way to get energy for life processes.
 - 3.2.2.1 Recognize breathing.
 - 3.2.2.2 Recognize that respiration provides energy to the cells of the body.
 - 3.2.2.3 Recognize that respiration occurs in plants and animals.
 - 3.2.2.4 Recognize that energy is needed by cells to carry on life processes.

Expanded Benchmarks

- 3.2.3 Identify that plants make their own food through photosynthesis.
 - 3.2.3.1 Recognize that plants make their own food.
 - 3.2.3.2 Recognize that plants make their food in the form of sugar.
 - 3.2.3.3 Recognize that photosynthesis is the process by which plants make food.

3.3 Describe models that trace the life cycles of different plants and animals and discuss how they differ from species to species.

Expanded Benchmarks

- 3.3.1 Identify three parts of the human life cycle.
 - 3.3.1.1 Recognize a baby.
 - 3.3.1.2 Recognize a child.
 - 3.3.1.3 Recognize an adult.
 - 3.3.1.4 Identify whether a person or representation of a person is a baby, child, or adult.
 - 3.3.1.5 Sequence baby, child, and adult as the life cycle of a human.

Expanded Benchmarks

- 3.3.2 Identify the major parts of the life cycle of a flowering plant.

- 3.3.2.1 Recognize a seed.
- 3.3.2.2 Recognize a seed as beginning to grow when the root begins to appear.
- 3.3.2.3 Recognize a seedling as a young plant.
- 3.3.2.4 Recognize a mature plant that can produce a flower and pods or fruits.
- 3.3.2.5 Sequence seed, seedling, and mature plant as the life cycle of a flowering plant.

Expanded Benchmarks

- 3.3.3 Recognize the major parts of the frog life cycle.
 - 3.3.3.1 Recognize an egg as the first stage.
 - 3.3.3.2 Recognize a tadpole as the second stage.
 - 3.3.3.3 Recognize a frog as the third stage.
 - 3.3.3.4 Sequence egg, tadpole, and frog as the life cycle of a frog.

Expanded Benchmarks

- 3.3.4 Recognize the major parts of the butterfly life cycle.
 - 3.3.4.1 Recognize an egg as the first stage.
 - 3.3.4.2 Recognize a caterpillar as the second stage.
 - 3.3.4.3 Recognize a chrysalis as the third stage.
 - 3.3.4.4 Recognize a butterfly as the fourth stage.
 - 3.3.4.5 Sequence egg, caterpillar, chrysalis, and butterfly as the life cycle of a butterfly.

Expanded Benchmarks

- 3.3.5 Recognize the life cycles of mammals, fish, birds, reptiles, and trees.
 - 3.3.5.1 Recognize that mammals gradually develop from birth to maturity.
 - 3.3.5.2 Recognize that fish are born live or hatched from eggs then gradually develop to maturity.
 - 3.3.5.3 Recognize that birds hatch from eggs, then develop to maturity while replacing their downy feathers with mature feathers.
 - 3.3.5.4 Recognize that reptiles hatch from eggs or are born live, then gradually develop to maturity.
 - 3.3.5.5 Recognize that trees develop from seeds to seedlings then gradually acquire bark and grow tall.

Expanded Benchmarks

- 3.3.6 Describe how life cycles of two organisms are different from each other.
 - 3.3.6.1 Recognize differences between the life cycles of two organisms.
 - 3.3.6.2 Identify differences between the life cycles of two organisms.

3.3a Communicate the differences in the reproductive processes of a variety of plants and animals using the principles of genetic modeling (e.g., Punnet squares).

Expanded Benchmarks

3.3.7 Recognize that the reproductive processes vary between different kinds of plants and animals.

3.3.7.1 Recognize that some organisms have only one parent (asexual reproduction).

3.3.7.2 Recognize that most organisms have two parents (sexual reproduction).

3.4 Explain cause and effect relationships between nonliving and living components within ecosystems; and explain individual response to the changes in the environment.

Expanded Benchmarks

3.4.1 Distinguish between living and nonliving things.

3.4.1.1 Recognize which is living when given a choice between something that is living and something that is nonliving.

3.4.1.2 Identify which components in a group are living and which are nonliving.

3.4.1.3 Group components into living and nonliving groups.

Expanded Benchmarks

3.4.2 Describe parts of an ecosystem.

3.4.2.1 Identify nonliving and living parts of an ecosystem.

3.4.2.2 Recognize how the parts of an ecosystem interact.

Expanded Benchmarks

3.4.3 Predict responses of organisms to changes in the environment.

3.4.3.1 Recognize that organisms change when something changes in their environment.

3.4.3.2 Identify organism responses to changes in their environment.

3.4.3.3 Recognize how the organisms change in response to environmental changes.

Expanded Benchmarks

3.4.4 Recognize that behaviors and characteristics are learned or inherited

3.4.4.1 Recognize that organisms look similar to their parents

3.4.4.2 Recognize that organisms have similar behaviors to their parents

3.5 Create and use a basic classification scheme to identify plants and animals, preferably using indigenous plants and animals.

Expanded Benchmarks

3.5.1 Sort plants and animals according to their similarities and differences.

3.5.1.1 Recognize similarities and differences between four to six plants and/or animals that are common locally.

- 3.5.1.2 Sort four to six animals and/or plants into two groups based on one or two similarities or differences.

Expanded Benchmarks

- 3.5.2 Classify plants and animals according to their similarities or differences.
 - 3.5.2.1 Recognize classification of plants and animals as sorting them according to their similarities or differences.
 - 3.5.2.2 Identify classification of plants and animals as sorting them according to their similarities or differences.
 - 3.5.2.3 Sort plants and/or animals according to their similarities or differences.

Expanded Benchmarks

- 3.5.3 Create a classification system.
 - 3.5.3.1 Create a classification system for up to four plants.
 - 3.5.3.2 Create a classification system for up to four animals.

Benchmarks

Grade 10

Students will:

3.1 Identify that plants and animals have structures and systems, which serve different functions.

Expanded Benchmarks

- 3.1.1 Distinguish plants from animals.
 - 3.1.1.1 Recognize plants.
 - 3.1.1.2 Recognize animals.
 - 3.1.1.3 When given a group of plants and animals, identify which individuals are plants or animals.

Expanded Benchmarks

- 3.1.2 Identify the structures and systems of animals.
 - 3.1.2.1 Recognize arms, legs, heads, bodies, antennae, eyes, nose, mouths and tails of animals.
 - 3.1.2.2 Identify arms, legs, heads, bodies, antennae, eyes, nose, mouths and tails of animals.
 - 3.1.2.3 Recognize that animals eat plants or other animals using their mouths.
 - 3.1.2.4 Identify the animal mouth as part of a system for obtaining nutrition.
 - 3.1.2.5 Recognize that animals breathe with lungs or gills.

Expanded Benchmarks

- 3.1.3 Identify the structures and systems of plants.
 - 3.1.3.1 Recognize seeds, roots, stems, leaves, and flowers of plants.
 - 3.1.3.2 Identify roots as the plant part that takes in water from the soil.
 - 3.1.3.3 Identify stems as the passageway through which water moves

throughout the plant.

3.1.3.4 Identify seeds and flowers as part of the reproductive system of plants.

3.1.3.5 Identify that plants take in carbon dioxide and give off oxygen.

3.1.3.6 Identify that plants make their own food.

Expanded Benchmarks

3.1.4 Identify the functions of the structures and systems of animals.

3.1.4.1 Identify the lungs or gills as part of a system for obtaining oxygen.

3.1.4.2 Recognize that arms and legs are used for moving.

3.1.4.3 Recognize that eyes are used for seeing.

3.1.4.4 Recognize that noses are used for smelling.

3.1.4.5 Recognize that antennae are used for sensing.

Expanded Benchmarks

3.1.5 Identify the functions of the structures and systems of plants.

3.1.5.1 Identify the function of the seeds and flowers as making new plants.

3.1.5.2 Identify the function of the roots as bringing water into the plant.

3.1.5.3 Identify the function of the stem as a passageway for the transport of water.

3.1a Investigate and use appropriate technology to demonstrate that cells have common features as well as differences that determine function and that they are composed of common building blocks. (e.g., proteins, carbohydrates, nucleic acids, lipids)

Expanded Benchmarks

3.1.6 Identify bacteria/germs as an organism that can cause disease.

3.1.6.1 Recognize bacteria/germs.

3.1.6.2 Identify one or two places where bacteria/germs might be found.

3.1.6.3 Identify that bacteria/germs cause some diseases.

Expanded Benchmarks

3.1.7 Compare plant cells and animal cells.

3.1.7.1 Attend to cells

3.1.7.2 Recognize a plant cell.

3.1.7.3 Recognize an animal cell.

3.1.7.4 Recognize differences between plant and animal cells.

Expanded Benchmarks

3.1.8 Identify microscopes as technology used to study cells.

3.1.8.1 Recognize a microscope.

3.1.8.2 Identify a microscope.

3.1.8.3 Identify that microscopes make things appear larger.

3.1.8.4 Describe a microscope and what it does.

3.2 Describe and explain the complex processes involved in energy use in cell maintenance, growth, repair, and development.

Expanded Benchmarks

3.2.1 Describe that all animal body systems (including those of humans) need energy from food.

3.2.1.1 Recognize that all animal body systems (including those of humans) need energy from food.

3.2.1.2 Identify that all animal body systems (including those of humans) need energy from food.

3.2.1.3 Describe that all animal body systems (including those of humans) need energy from food.

Expanded Benchmarks

3.2.2 Recognize that respiration is a way to get energy for life processes.

3.2.2.1 Recognize breathing.

3.2.2.2 Recognize that respiration provides energy to the cells of the body.

3.2.2.3 Recognize that respiration occurs in all plants and animals.

3.2.2.4 Recognize that energy is needed by cells to carry on life processes.

Expanded Benchmarks

3.2.3 Identify that plants make their own food through photosynthesis.

3.2.3.1 Recognize that plants make their own food.

3.2.3.2 Recognize that plants make their food in the form of sugar.

3.2.3.3 Recognize that photosynthesis is the process by which plants make food.

3.3 Describe models that trace the life cycles of different plants and animals and discuss how they differ from species to species.

Expanded Benchmarks

3.3.1 Identify three parts of the human life cycle.

3.3.1.1 Recognize a baby.

3.3.1.2 Recognize a child.

3.3.1.3 Recognize an adult.

3.3.1.4 Identify whether a person or representation of a person is a baby, child, or adult.

3.3.1.5 Sequence baby, child, and adult as the life cycle of a human.

Expanded Benchmarks

3.3.2 Identify the major parts of the life cycle of a flowering plant.

3.3.2.1 Recognize a seed.

3.3.2.2 Recognize a seed as beginning to grow when the root begins to appear.

3.3.2.3 Recognize a seedling as a young plant.

3.3.2.4 Recognize a mature plant that can produce a flower and pods or fruits.

3.3.2.5 Sequence seed, seedling, and mature plant as the life cycle of a flowering plant.

Expanded Benchmarks

- 3.3.3 Recognize the major parts of the frog life cycle.
 - 3.3.3.1 Recognize an egg as the first stage.
 - 3.3.3.2 Recognize a tadpole as the second stage.
 - 3.3.3.3 Recognize a frog as the third stage.
 - 3.3.3.4 Sequence egg, tadpole, and frog as the life cycle of a frog.

Expanded Benchmarks

- 3.3.4 Recognize the major parts of the butterfly life cycle.
 - 3.3.4.1 Recognize an egg as the first stage.
 - 3.3.4.2 Recognize a caterpillar as the second stage.
 - 3.3.4.3 Recognize a chrysalis as the third stage.
 - 3.3.4.4 Recognize a butterfly as the fourth stage.
 - 3.3.4.5 Sequence egg, caterpillar, chrysalis, and butterfly as the life cycle of a butterfly.

Expanded Benchmarks

- 3.3.5 Recognize the life cycles of mammals, fish, birds, reptiles, and trees.
 - 3.3.5.1 Recognize that mammals gradually develop from birth to maturity.
 - 3.3.5.2 Recognize that fish are born live or hatched from eggs then gradually develop to maturity.
 - 3.3.5.3 Recognize that birds hatch from eggs, then develop to maturity while replacing their downy feathers with mature feathers.
 - 3.3.5.4 Recognize that reptiles hatch from eggs or are born live, then gradually develop to maturity.
 - 3.3.5.5 Recognize that trees develop from seeds to seedlings then gradually acquire bark and grow tall.

Expanded Benchmarks

- 3.3.6 Describe how life cycles of two organisms are different from each other.
 - 3.3.6.1 Recognize differences between the life cycles of two organisms.
 - 3.3.6.2 Identify differences between the life cycles of two organisms.
 - 3.3.6.3 Describe differences between the life cycles of two organisms.

3.3a Communicate the differences in the reproductive processes of a variety of plants and animals using the principles of genetic modeling (e.g., Punnet squares).

Expanded Benchmarks

- 3.3.7 Recognize that the reproductive processes vary between different kinds of plants and animals.
 - 3.3.7.1 Recognize that some organisms have only one parent (asexual reproduction).
 - 3.3.7.2 Recognize that most organisms have two parents (sexual reproduction).
 - 3.3.7.3 Distinguish between organisms that reproduce with one parent and organisms that reproduce with two parents.
 - 3.3.7.4 Recognize differences in reproduction of different organisms.

3.4 Explain cause and effect relationships between nonliving and living components within ecosystems; and explain individual response to the changes in the environment.

Expanded Benchmarks

- 3.4.1 Distinguish between living and nonliving things.
 - 3.4.1.1 Recognize which is living when given a choice between something that is living and something that is nonliving.
 - 3.4.1.2 Identify which components in a group are living and which are nonliving.
 - 3.4.1.3 Group components into living and nonliving groups.

Expanded Benchmarks

- 3.4.2 Describe parts of an ecosystem.
 - 3.4.2.1 Identify nonliving and living parts of an ecosystem.
 - 3.4.2.2 Recognize how the parts of an ecosystem interact.
 - 3.4.2.3 Identify interactions between parts of an ecosystem.
 - 3.4.2.4 Describe examples of interactions between parts of an ecosystem.

Expanded Benchmarks

- 3.4.3 Predict responses of organisms to changes in the environment.
 - 3.4.3.1 Recognize that organisms change when something changes in their environment.
 - 3.4.3.2 Identify organism responses to changes in their environment.
 - 3.4.3.3 Recognize how the organisms change in response to environmental changes
 - 3.4.3.4 Predict how an organism will respond to simple changes in their environment.

Expanded Benchmarks

- 3.4.4 Recognize that behaviors and characteristics are learned or inherited
 - 3.4.4.1 Recognize that organisms look similar to their parents
 - 3.4.4.2 Recognize that organisms have similar behaviors to their parents

3.5 Create and use a basic classification scheme to identify plants and animals, preferably using indigenous plants and animals.

Expanded Benchmarks

- 3.5.1 Sort plants and animals according to their similarities and differences.
 - 3.5.1.1 Recognize similarities and differences between four to six plants and/or animals that are common locally.
 - 3.5.1.2 Sort the four to six animals and/or plants into two groups based on one or two similarities or differences.
 - 3.5.1.3 Identify a similarity or difference used to sort the four to six animals and/or plants.

Expanded Benchmarks

3.5.2 Classify plants and animals according to their similarities or differences.

3.5.2.1 Recognize classification of plants and animals as sorting them according to their similarities or differences.

3.5.2.2 Identify classification of plants and animals as sorting them according to their similarities or differences.

3.5.2.3 Sort plants and/or animals according to their similarities or differences.

Expanded Benchmarks

3.5.3 Create a classification system.

3.5.3.1 Create a classification system for up to four plants.

3.5.3.2 Create a classification system for up to four animals.

3.5.3.3 Classify one additional plant or animal using the created classification system.

MONTANA STANDARDS AND EXPANDED BENCHMARKS FOR SCIENCE

Science Content Standard 4

Students demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space, and demonstrate the thinking skills associated with this knowledge.

Essence of Standard 4:

Rationale

By studying Earth, its composition, history and the processes that shape it, students gain a better understanding of the planet on which they live. Changes in lithosphere, atmosphere, and hydrosphere have profound effects on human existence. Knowledge of the Solar System and the universe helps students make predictions about Earth and informed decisions about the future of space exploration.

Benchmarks

Grade 4

Students will:

4.1 Describe and give examples of Earth's changing features.

Expanded Benchmarks

4.1.1 Identify Earth's features.

- 4.1.1.1 Attend to Earth's changing features
- 4.1.1.2 Identify a hill or mountain.
- 4.1.1.3 Identify a valley or canyon.
- 4.1.1.4 Identify a lake.
- 4.1.1.5 Identify a river.
- 4.1.1.6 Identify a volcano.
- 4.1.1.7 Identify an ocean.
- 4.1.1.8 Identify an island.

Expanded Benchmarks

4.1.2 Identify that some of Earth's changes happen quickly.

- 4.1.2.1 Identify a fast change.
- 4.1.2.2 Demonstrate a fast change.
- 4.1.2.3 Identify some floods, landslides, earthquakes, and volcanic eruptions as a fast change.

Expanded Benchmarks

4.1.3 Identify that some of Earth's changes happen slowly.

- 4.1.3.1 Identify a slow change.
- 4.1.3.2 Demonstrate a slow change.
- 4.1.3.3 Identify weathering and some erosion processes as slow changes.

4.2 Describe the physical properties of earth's basic materials. (including soil, rocks, water and gases)

Expanded Benchmarks

4.2.1 Describe the physical properties of soil/dirt.

- 4.2.1.1 Attend to soil/dirt.
- 4.2.1.2 Identify soil/dirt.
- 4.2.1.3 Distinguish soil/dirt from other objects or materials.
- 4.2.1.4 Describe soil/dirt using one physical property. (e.g. color, texture, smell, weight)
- 4.2.1.5 Describe the uses of soil/dirt.

Expanded Benchmarks

4.2.2 Describe the physical properties of rocks. (including minerals)

- 4.2.2.1 Attend to rocks.
- 4.2.2.2 Identify rocks.
- 4.2.2.3 Distinguish rocks from other objects or materials.
- 4.2.2.4 Describe rocks using one physical property. (e.g. color, size, shape, texture, weight)

Expanded Benchmarks

4.2.3 Describe the physical properties of water.

- 4.2.3.1 Attend to water.
- 4.2.3.2 Identify water.
- 4.2.3.3 Distinguish water from other objects or materials.
- 4.2.3.4 Describe one use of water.

Expanded Benchmarks

4.2.4 Describe the physical properties of air.

- 4.2.4.1 Attend to air.
- 4.2.4.2 Identify air.
- 4.2.4.3 Distinguish air from other objects or materials.
- 4.2.4.4 Describe one use of air.

4.3 Investigate fossils and make inferences about life and the environment long ago.

Expanded Benchmarks

4.3.1 Identify fossils.

- 4.3.1.1 Distinguish one to two similarities and differences between fossils and live organisms.
- 4.3.1.2 Identify a fossil.

4.4 Observe and describe local weather and demonstrate how weather conditions are measured.

Expanded Benchmarks

4.4.1 Determine weather conditions and record the information daily.

4.4.1.1 Attend to weather measurement instruments.

4.4.1.2 Identify weather measurement instruments.

4.4.1.3 Read temperature from a thermometer.

4.4.1.4 Read wind direction from a wind vane.

4.4.1.5 Read the amount of rain from a rain gauge.

4.4.1.6 Record the information about the weather daily.

4.4a Describe the water cycle, the composition and structure of the atmosphere and the impact of oceans on large scale weather patterns.

Expanded Benchmarks

4.4.2 Describe the water cycle.

4.4.2.1 Attend to the weather

4.4.2.2 Recognize that rain is liquid water

4.4.2.3 Identify that liquid water can change to gas, then back to liquid.

4.4.2.4 Associate clouds with water.

4.4.2.5 Recognize that rain is liquid water.

4.4.2.6 Recognize that lakes and rivers have water in them.

4.4.2.7 Recognize that rain and snow can also fill the lakes and rivers.

4.5 Identify seasons and explain the difference between weather and climate.

Expanded Benchmarks

4.5.1 Identify seasons.

4.5.1.1 Attend to the seasons.

4.5.1.2 Recognize that winter is usually the colder time of year.

4.5.1.3 Recognize that in spring the weather becomes warmer.

4.5.1.4 Recognize that summer is usually the hottest time of year.

4.5.1.5 Recognize that fall is the time that the weather begins to become colder.

4.5.1.6 Recognize winter, spring, summer, and fall.

4.6 Identify objects (e.g., moon, stars, and meteors) in the sky and explain that light and heat comes from a star called the Sun.

Expanded Benchmarks

4.6.1 Identify the Sun.

4.6.1.1 Attend to the Sun

4.6.1.2 Identify the Sun.

Expanded Benchmarks

4.6.2 Explain that light and heat comes from a star called the Sun.

4.6.2.1 Identify that light and heat come from the Sun.

Expanded Benchmarks

4.6.3. Identify the Moon.

4.6.3.1 Attend to the Moon

4.6.3.2 Identify the Moon.

Expanded Benchmarks

4.6.4. Identify the stars.

4.6.4.1 Attend to the stars

4.6.4.2 Recognize the stars.

Expanded Benchmarks

4.6.5 Identify additional objects in the solar system.

4.6.5.1 Attend to the planets.

4.6.5.2 Recognize planets.

4.7 Identify technology and methods used for space exploration.

Expanded Benchmarks

4.7.1 Identify that telescopes are used for space exploration.

4.7.1.1 Recognize a simple telescope.

Expanded Benchmarks

4.7.2 Identify that spacecraft are used for space exploration.

4.7.2.1 Recognize spacecraft. (e.g. space shuttles, space stations, and rockets)

Benchmarks

Grade 8

Students will:

4.1 Describe and give examples of Earth's changing features.

Expanded Benchmarks

4.1.1 Identify Earth's features.

4.1.1.1 Attend to Earth's changing features

4.1.1.2 Identify a hill or mountain.

4.1.1.3 Identify a valley or canyon.

4.1.1.4 Identify a lake.

4.1.1.5 Identify a river.

4.1.1.6 Identify a volcano.

4.1.1.7 Identify an ocean.

4.1.1.8 Identify an island.

4.1.1.9 Identify a plain.

Expanded Benchmarks

4.1.2 Identify that some of Earth's changes happen quickly.

4.1.2.1 Identify a fast change.

4.1.2.2 Demonstrate a fast change.

4.1.2.3 Identify some floods, landslides, earthquakes, and volcanic eruptions as a fast change.

Expanded Benchmarks

4.1.3 Identify that some of Earth's changes happen slowly.

4.1.3.1 Identify a slow change.

4.1.3.2 Demonstrate a slow change.

4.1.3.3 Identify weathering and some erosion processes as slow changes.

4.1b Understand the theory of plate tectonics and how it explains the inter relationship between earthquakes, volcanoes, and seafloor spreading.

Expanded Benchmarks

4.1.4 Identify that the surface of Earth is made of many moving pieces.

4.1.4.1 Identify that the surface of Earth is made of many pieces that move.

Expanded Benchmarks

4.1.5 Recognize that many of Earth's surface features form when surface pieces collide and move apart.

4.1.5.1 Recognize that mountains can form where pieces collide.

4.2 Describe the physical properties of Earth's basic materials. (including soil, rocks, water, and gases)

Expanded Benchmarks

4.2.1 Describe the physical properties of soil/dirt.

4.2.1.1 Attend to soil/dirt.

4.2.1.2 Identify soil/dirt.

4.2.1.3 Distinguish soil/dirt from other objects or materials.

4.2.1.4 Describe soil/dirt using one to two physical properties. (e.g. color, size, and shape of particles, texture, smell, weight)

4.2.1.5 Describe the uses of soil/dirt.

Expanded Benchmarks

4.2.2 Describe the physical properties of rocks. (including minerals)

4.2.2.1 Attend to rocks.

4.2.2.2 Identify rocks.

4.2.2.3 Distinguish rocks from other objects or materials.

4.2.2.4 Describe rocks using one to two physical properties. (e.g. color, size, and shape of particles, texture, weight/density)

Expanded Benchmarks

4.2.3 Describe the physical properties of water.

4.2.3.1 Attend to water.

4.2.3.2 Identify water.

4.2.3.3 Distinguish water from other objects or materials.

4.2.3.4 Describe one to two uses of water.

Expanded Benchmarks

4.2.4 Describe the physical properties of air.

4.2.4.1 Attend to air.

4.2.4.2 Identify air.

4.2.4.3 Distinguish air from other objects or materials.

4.2.4.4 Describe one to two uses of air.

4.2a Differentiate between both rock types and mineral types and classify both by how they are formed and the utilization by humans.

Expanded Benchmarks

4.2.5 Group igneous, metamorphic, and sedimentary rocks into three categories.

4.2.5.1 Sort up to six rocks (from three different categories) into three groups based on similarities and differences.

Expanded Benchmarks

4.2.6 Recognize that rocks are made up of different minerals.

4.2.6.1 Recognize the different-colored minerals in a rock.

Expanded Benchmarks

4.2.7 Identify how some rocks and minerals are used by people.

4.2.7.1 Identify a rock or mineral being used.

4.3 Investigate fossils and make inferences about life and the environment long ago.

Expanded Benchmarks

4.3.1 Identify how fossils form.

4.3.1.1 Distinguish two to three similarities and differences between fossils and live organisms.

4.3.1.2 Identify a fossil.

4.3.1.3 Identify how a fossil forms.

4.4 Observe and describe local weather and demonstrate how weather conditions are measured.

Expanded Benchmarks

4.4.1 Determine weather conditions and record the information daily.

4.4.1.1 Attend to weather measurement instruments.

4.4.1.2 Identify weather measurement instruments.

- 4.4.1.3 Read temperature from a thermometer.
- 4.4.1.4 Read wind direction from a wind vane.
- 4.4.1.5 Read the amount of rain from a rain gauge.
- 4.4.1.6 Record the information about the weather daily.

4.4a Describe the water cycle, the composition and structure of the atmosphere and the impact of oceans on large scale weather patterns.

Expanded Benchmarks

- 4.4.2 Describe the water cycle.
 - 4.4.2.1 Attend to the weather
 - 4.4.2.2 Recognize that rain is liquid water
 - 4.4.2.3 Identify that liquid water can change to gas, then back to liquid.
 - 4.4.2.4 Associate clouds with water.
 - 4.4.2.5 Recognize that rain is liquid water.
 - 4.4.2.6 Recognize that lakes and rivers have water in them.
 - 4.4.2.7 Recognize that rain and snow can also fill the lakes and rivers.

4.5 Identify seasons and explain the difference between weather and climate.

Expanded Benchmarks

- 4.5.1 Identify seasons.
 - 4.5.1.1 Attend to the seasons.
 - 4.5.1.2 Recognize that winter is usually the colder time of year.
 - 4.5.1.3 Recognize that in spring the weather becomes warmer.
 - 4.5.1.4 Recognize that summer is usually the hottest time of year.
 - 4.5.1.5 Recognize that fall is the time that the weather begins to become colder.
 - 4.5.1.6 Recognize winter, spring, summer, and fall.

4.6 Identify objects (e.g., moon, stars, and meteors) in the sky and explain that light and heat comes from a star called the Sun.

Expanded Benchmarks

- 4.6.1 Identify the Sun.
 - 4.6.1.1 Attend to the Sun
 - 4.6.1.2 Identify the Sun.

Expanded Benchmarks

- 4.6.2 Explain that light and heat comes from a star called the Sun.
 - 4.6.2.1 Identify that light and heat come from the Sun.

Expanded Benchmarks

- 4.6.3. Identify the Moon.
 - 4.6.3.1 Attend to the Moon
 - 4.6.3.2 Identify the Moon.
 - 4.6.3.3 Recognize there are changes in the shape of the Moon.

Expanded Benchmarks

4.6.4 Identify the stars.

4.6.4.1 Attend to the stars

4.6.4.2 Recognize the stars.

Expanded Benchmarks

4.6.5 Identify additional objects in the solar system.

4.6.5.1 Attend to the planets.

4.6.5.2 Recognize planets.

4.6.5.3 Identify one to two planets.

4.6a Describe Earth, Moon, planets, and other objects in space in terms of size, structure, and movement in relation to the Sun.

Expanded Benchmarks

4.6.6 Describe Earth in terms of size, structure, and movement in relation to the Sun.

4.6.6.1 Recognize that Earth is smaller than the Sun.

4.6.6.2 Demonstrate the movement of Earth in relation to the Sun.

Expanded Benchmarks

4.6.7 Describe the moon in terms of movement in relation to the earth.

4.6.7.1 Recognize the moon is smaller than the sun and earth.

4.6.7.2 Demonstrate the movement of the Moon in relation to Earth.

4.7 Identify technology and methods used for space exploration.

Expanded Benchmarks

4.7.1 Identify that telescopes are used for space exploration.

4.7.1.1 Recognize a simple telescope.

4.7.1.2 Describe the use of a telescope.

Expanded Benchmarks

4.7.2 Identify that spacecraft are used for space exploration.

4.7.2.1 Recognize spacecraft. (e.g. space shuttles, space stations, and rockets)

4.7.2.2 Explain the use of spacecraft.

Benchmarks

Grade 10

Students will:

4.1 Describe and give examples of Earth's changing features.

Expanded Benchmarks

4.1.1 Identify Earth's features.

4.1.1.1 Attend to Earth's changing features

- 4.1.1.2 Identify a hill or mountain.
- 4.1.1.3 Identify a valley or canyon.
- 4.1.1.4 Identify a lake.
- 4.1.1.5 Identify a river.
- 4.1.1.6 Identify a volcano.
- 4.1.1.7 Identify an ocean.
- 4.1.1.8 Identify an island.
- 4.1.1.9 Identify a plain.
- 4.1.1.10 Identify a plateau.

Expanded Benchmarks

- 4.1.2 Identify that some of Earth's changes happen quickly.
 - 4.1.2.1 Identify a fast change.
 - 4.1.2.2 Demonstrate a fast change.
 - 4.1.2.3 Identify some floods, landslides, earthquakes; and volcanic eruptions as a fast change.

Expanded Benchmarks

- 4.1.3 Identify that some of Earth's changes happen slowly.
 - 4.1.3.1 Identify a slow change.
 - 4.1.3.2 Demonstrate a slow change.
 - 4.1.3.3 Identify weathering and some erosion processes as slow changes.

4.1b Understand the theory of plate tectonics and how it explains the inter-relationship between earthquakes, volcanoes, and seafloor spreading.

Expanded Benchmarks

- 4.1.4 Identify that the surface of Earth is made of many moving pieces.
 - 4.1.4.1 Identify that the surface of Earth is made of many pieces that move.
 - 4.1.4.2 Recognize that the pieces can move together.
 - 4.1.4.3 Recognize that the pieces can move apart.

Expanded Benchmarks

- 4.1.5 Identify that many of Earth's surface features form when surface pieces collide and move apart.
 - 4.1.5.1 Recognize that mountains and volcanoes can form where pieces collide.
 - 4.1.5.2 Recognize that volcanic activity occurs where pieces move apart.

Expanded Benchmarks

- 4.1.6 Recognize that volcanoes and earthquakes mostly occur on the edges of plates (surface pieces).
 - 4.1.6.1 Recognize that patterns of volcanos and earthquakes happen mostly along plate edges.

4.2 Describe the physical properties of Earth's basic materials. (including soil, rocks, water, and gases)

Expanded Benchmarks

- 4.2.1 Describe the physical properties of soil.
 - 4.2.1.1 Attend to soil/dirt.
 - 4.2.1.2 Identify soil/dirt.
 - 4.2.1.3 Distinguish soil from other objects or materials.
 - 4.2.1.4 Describe soil using one to four physical properties. (e.g. color, size, and shape of particles, texture, smell, weight)
 - 4.2.1.5 Describe the uses of soil/dirt.

Expanded Benchmarks

- 4.2.2 Describe the physical properties of rocks. (including minerals)
 - 4.2.2.1 Attend to rocks.
 - 4.2.2.2 Identify rocks.
 - 4.2.2.3 Distinguish rocks from other objects or materials.
 - 4.2.2.4 Describe rocks using one to four physical properties. (e.g. color, size, and shape of particles, shape, texture, weight/density)

Expanded Benchmarks

- 4.2.3 Describe the physical properties of water.
 - 4.2.3.1 Attend to water.
 - 4.2.3.2 Identify water.
 - 4.2.3.3 Distinguish water from other objects or materials.
 - 4.2.3.4 Describe one to four uses of water.

Expanded Benchmarks

- 4.2.4 Describe the physical properties of air.
 - 4.2.4.1 Attend to air.
 - 4.2.4.2 Identify air.
 - 4.2.4.3 Distinguish air from other objects or materials.
 - 4.2.4.4 Describe one to three uses of air.

4.2a Identify and classify rocks and minerals based on physical and chemical properties and the utilization by humans.

Expanded Benchmarks

- 4.2.5 Group igneous, metamorphic, and sedimentary rocks into three categories.
 - 4.2.5.1 Sort up to twelve rocks (from three different categories) into three groups based on similarities and differences.

Expanded Benchmarks

- 4.2.6 Recognize that rocks are made up of different minerals.
 - 4.2.6.1 Recognize the different colored minerals in a rock.
 - 4.2.6.2 Recognize the properties that can be used to identify minerals.

Expanded Benchmarks

4.2.7 Identify how some rocks and minerals are used by people.

4.2.7.1 Identify a rock or mineral being used.

4.2.7.2 Identify three ways that a rock or mineral can be used.

4.3 Investigate fossils and make inferences about life and the environment long ago.

Expanded Benchmarks

4.3.1 Identify how fossils form.

4.3.1.1 Distinguish three to four similarities and differences between fossils and live organisms.

4.3.1.2 Identify a fossil.

4.3.1.3 Identify how fossils form.

4.4 Observe and describe local weather and demonstrate how weather conditions are measured.

Expanded Benchmarks

4.4.1 Determine weather conditions and record the information daily.

4.4.1.1 Attend to weather measurement instruments.

4.4.1.2 Identify weather measurement instruments.

4.4.1.3 Read temperature from a thermometer.

4.4.1.4 Read wind direction from a wind vane.

4.4.1.5 Read the amount of rain from a rain gauge.

4.4.1.6 Record the information about the weather daily.

4.4a Describe the water cycle, the composition and structure of the atmosphere and the impact of oceans on large scale weather patterns.

Expanded Benchmarks

4.4.2 Describe the water cycle.

4.4.2.1 Attend to the weather

4.4.2.2 Recognize that rain is liquid water

4.4.2.3 Identify that liquid water can change to gas, then back to liquid.

4.4.2.4 Associate clouds with water.

4.4.2.5 Recognize that rain is liquid water.

4.4.2.6 Recognize that lakes and rivers have water in them.

4.4.2.7 Recognize that rain and snow can also fill the lakes and rivers.

4.4b Collect and analyze local, regional predictions about weather patterns and global weather-related data by using appropriate technology in order to make inferences and predictions about weather patterns.

Expanded Benchmarks

4.4.3 Collect local weather predictions.

4.4.3.1 Get information about the weather from a weather report.

4.5 Identify seasons and explain the difference between weather and climate.

Expanded Benchmarks

4.5.1 Identify seasons.

- 4.5.1.1 Attend to the seasons.
- 4.5.1.2 Recognize that winter is usually the colder time of year.
- 4.5.1.3 Recognize that in spring the weather becomes warmer.
- 4.5.1.4 Recognize that summer is usually the hottest time of year.
- 4.5.1.5 Recognize that fall is the time that the weather begins to become colder.
- 4.5.1.6 Recognize winter, spring, summer, and fall.

4.6 Identify objects (e.g., moon, stars, and meteors) in the sky and explain that light and heat comes from a star called the Sun.

Expanded Benchmarks

4.6.1 Identify the Sun.

- 4.6.1.1 Attend to the Sun
- 4.6.1.2 Identify the Sun.

Expanded Benchmarks

4.6.2 Explain that light and heat comes from a star called the Sun.

- 4.6.2.1 Identify that light and heat come from the Sun.
- 4.6.2.2 Explain why light and heat from the Sun are important.

Expanded Benchmarks

4.6.3 Identify the Moon.

- 4.6.3.1 Attend to the Moon
- 4.6.3.2 Identify the Moon.
- 4.6.3.3 Recognize there are changes in the shape of the Moon over a period of time.

Expanded Benchmarks

4.6.4 Identify the stars.

- 4.6.4.1 Attend to the stars
- 4.6.4.2 Recognize the stars.

Expanded Benchmarks

4.6.5 Identify additional objects in the solar system.

- 4.6.5.1 Attend to the planets.
- 4.6.5.2 Recognize planets.
- 4.6.5.3 Identify one to four planets.

4.6a Describe Earth, Moon, planets, and other objects in space in terms of size, structure, and movement in relation to the Sun.

Expanded Benchmarks

4.6.6 Describe Earth in terms of size, structure, and movement in relation to the Sun.

4.6.6.1 Recognize Earth is smaller than the Sun.

4.6.6.2 Demonstrate the movement of Earth in relation to the Sun.

Expanded Benchmarks

4.6.7 Describe the Moon in terms of size and movement in relation to Earth.

4.6.7.1 Recognize the moon is smaller than the Sun and Earth.

4.6.7.2 Demonstrate the movement of the Moon in relation to the Earth.

4.7 Identify technology and methods used for space exploration.

Expanded Benchmarks

4.7.1 Identify that telescopes are used for space exploration.

4.7.1.1 Recognize a simple telescope.

4.7.1.2 Describe the use and importance of a telescope.

Expanded Benchmarks

4.7.2 Identify that spacecraft are used for space exploration.

4.7.2.1 Recognize spacecraft. (e.g. space shuttles, space stations, and rockets)

4.7.2.2 Explain the use and importance of spacecraft.

MONTANA STANDARDS AND EXPANDED BENCHMARKS FOR SCIENCE

Science Content Standard 5

Students understand how scientific knowledge and technological development impact today's societies and cultures.

Essence of Standard 5

Rationale

Our world and human activity is shaped in many ways by the advances in science. Science and technology are reciprocal in that science drives technological advances and these advances drive future scientific endeavors. Many different cultures make contributions to science and technology. These advances affect different societies in different ways. It is vital that students understand the interrelationships of science, technology and human activity.

Benchmarks

Grade 4

Students will:

5.1 Describe and discuss examples of how people use science and technology.

Expanded Benchmarks

5.1.1 Identify that science is one way of answering questions about the natural world.

5.1.1.1 Recognize science as a way of answering questions about the natural world.

5.1.1.2 Identify science as a way of answering questions about the natural world.

Expanded Benchmarks

5.1.2 Identify that technology consists of tools and techniques to solve problems.

5.1.2.1 Recognize technology as tools and techniques to solve problems.

5.1.2.2 Identify technology as tools and techniques to solve problems.

Expanded Benchmarks

5.1.3 Describe examples of the use of science and technology by people.

5.1.3.1 Recognize that science and technology have always been used by people of all ages, backgrounds, and groups.

5.1.3.2 Recognize the tools they use in science class as examples of technology.

5.1.3.3 Identify the use of tools in science class as examples of technology.

5.2 Describe a scientific or technological innovation that impacts communities, cultures, and societies.

Expanded Benchmarks

5.2.1 Describe medical care as an example of scientific or technological innovation that impacts communities, cultures, and societies.

- 5.2.1.1 Recognize that medical treatment received is a benefit of scientific or technological innovation.
- 5.2.1.2 Identify medical treatment as a benefit of scientific or technological innovation.

Expanded Benchmarks

5.2.2 Describe clothes fasteners (buttons, zippers etc.) as an example of scientific or technological innovation that impacts communities, cultures, and societies.

- 5.2.2.1 Recognize clothes fasteners as a benefit of scientific or technological innovation.
- 5.2.2.2 Identify clothes fasteners as a benefit of scientific or technological innovation.

5.3 Simulate scientific collaboration by sharing and communicating ideas to identify and describe problems.

Expanded Benchmarks

5.3.1 Identify problems that can be solved through science or technology.

- 5.3.1.1 Recognize a problem.
- 5.3.1.2 Identify a problem.
- 5.3.1.3 Identify that the problem can be solved through science or technology.

Expanded Benchmarks

5.3.2 Make a plan to solve a problem.

- 5.3.2.1 Identify tools needed to solve a problem.
- 5.3.2.2 Identify how the tools will be used to solve the problem.

Expanded Benchmarks

5.3.3 Communicate the plan to solve the problem.

- 5.3.3.1 Indicate the problem to a teacher or fellow student.
- 5.3.3.2 Indicate the plan to solve the problem to a teacher or fellow student.
- 5.3.3.3 Attend to comments about the plan.

5.4 Use scientific knowledge to make inferences and propose solutions for simple environmental problems. (e.g., recycling, waste management)

Expanded Benchmarks

5.4.1 Identify simple environmental problems.

- 5.4.1.1 Recognize waste as a simple environmental problem.
- 5.4.1.2 Identify waste as a simple environmental problem.

Expanded Benchmarks

5.4.2 Propose solutions for simple environmental problems.

- 5.4.2.1 Recognize that recycling is a solution to waste disposal.
- 5.4.2.2 Identify that recycling is a solution to waste disposal.

Benchmarks

Grade 8

Students will:

5.1 Describe the specific fields of science and technology as they relate to occupations within those fields.

Expanded Benchmarks

5.1.1 Identify that science is one way of answering questions about the natural world.

5.1.1.1 Recognize science as a way of answering questions about the natural world.

5.1.1.2 Identify science as a way of answering questions about the natural world.

Expanded Benchmarks

5.1.2 Identify that technology consists of tools and techniques to solve problems.

5.1.2.1 Recognize technology as tools and techniques to solve problems.

5.1.2.2 Identify technology as tools and techniques to solve problems.

Expanded Benchmarks

5.1.3 Describe examples of the use of science and technology by people.

5.1.3.1 Recognize that science and technology have always been used by people of all ages, backgrounds, and groups.

5.1.3.2 Recognize the tools they use in science class as examples of technology.

5.1.3.3 Identify the use of tools in science class as examples of technology.

Expanded Benchmarks

5.1.4 Recognize that many people work in the fields of science.

5.1.4.1 Recognize that some people work as scientists.

5.1.4.2 Recognize that some people work to assist scientists.

5.1.4.3 Recognize that some people work in the health field, including doctors and nurses.

5.2 Describe a scientific or technological innovation that impacts communities, cultures, and societies.

Expanded Benchmarks

5.2.1 Describe medical care as an example of scientific or technological innovation that impacts communities, cultures, and societies.

5.2.1.1 Recognize that medical treatment received is a benefit of scientific or technological innovation.

5.2.1.2 Identify medical treatment as a benefit of scientific or technological innovation.

Expanded Benchmarks

5.2.2 Describe clothes fasteners (buttons, zippers etc.) as an example of scientific or technological innovation that impacts communities, cultures, and societies.

- 5.2.2.1 Recognize clothes fasteners as a benefit of scientific or technological innovation.
- 5.2.2.2 Identify clothes fasteners as a benefit of scientific or technological innovation.

5.3 Simulate collaborative problem solving and give examples of how scientific knowledge and technology are shared with other scientists and the public.

Expanded Benchmarks

- 5.3.1 Identify problems that can be solved through science or technology.
 - 5.3.1.1 Recognize a problem.
 - 5.3.1.2 Identify a problem.
 - 5.3.1.3 Identify that the problem can be solved through science or technology.

Expanded Benchmarks

- 5.3.2 Make a plan to solve a problem.
 - 5.3.2.1 Identify tools needed to solve a problem.
 - 5.3.2.2 Identify how the tools will be used to solve the problem.

Expanded Benchmarks

- 5.3.3 Communicate the plan to solve the problem.
 - 5.3.3.1 Indicate the problem to a teacher or fellow student.
 - 5.3.3.2 Indicate the plan to solve the problem to a teacher or fellow student.
 - 5.3.3.3 Attend to comments about the plan.

Expanded Benchmarks

- 5.3.4 Recognize that scientific knowledge is shared with other scientists and the public.
 - 5.3.4.1 Attend to a reading passage or broadcast where scientific knowledge is being shared.
 - 5.3.4.2 Recognize that the reading passage or broadcast is sharing scientific knowledge.

5.4 Use scientific knowledge to investigate problems and their proposed solutions and evaluate those solutions while considering environmental impacts.

Expanded Benchmarks

- 5.4.1 Identify simple environmental problems.
 - 5.4.1.1 Recognize waste as a simple environmental problem.
 - 5.4.1.2 Identify waste as a simple environmental problem.

Expanded Benchmarks

- 5.4.2 Propose solutions for simple environmental problems.
 - 5.4.2.1 Recognize that recycling is a solution to waste disposal.
 - 5.4.2.2 Identify that recycling is a solution to waste disposal.

Expanded Benchmarks

- 5.4.3 Determine whether a solution to a problem has been effective.

- 5.4.3.1 Recognize whether a solution has been effective.
- 5.4.3.2 Identify whether a solution has been effective.

Benchmarks

Grade 10

Students will:

5.1 Describe the specific fields of science and technology as they relate to occupations within those fields.

Expanded Benchmarks

- 5.1.1 Identify that science is one way of answering questions about the natural world.
 - 5.1.1.1 Recognize science as a way of answering questions about the natural world.
 - 5.1.1.2 Identify science as a way of answering questions about the natural world.

Expanded Benchmarks

- 5.1.2 Identify that technology consists of tools and techniques to solve problems.
 - 5.1.2.1 Recognize technology as tools and techniques to solve problems.
 - 5.1.2.2 Identify technology as tools and techniques to solve problems.

Expanded Benchmarks

- 5.1.3 Describe examples of the use of science and technology by people.
 - 5.1.3.1 Recognize that science and technology have always been used by people of all ages, backgrounds, and groups.
 - 5.1.3.2 Recognize the tools they use in science class as examples of technology.
 - 5.1.3.3 Identify the use of tools in science class as examples of technology.

Expanded Benchmarks

- 5.1.4 Recognize that many people work in the fields of science.
 - 5.1.4.1 Recognize that some people work as scientists.
 - 5.1.4.2 Recognize that some people work to assist scientists.
 - 5.1.4.3 Recognize that some people work in the health field, including doctors and nurses.
 - 5.1.4.4 Identify that some people work as scientists.
 - 5.1.4.5 Identify that some people work to assist scientists.
 - 5.1.4.6 Identify that some people work in the health field, including doctors and nurses.

5.2 Describe a scientific or technological innovation that impacts communities, cultures, and societies.

Expanded Benchmarks

- 5.2.1 Describe medical care as an example of scientific or technological innovation that impacts communities, cultures, and societies.

- 5.2.1.1 Recognize that medical treatment received is a benefit of scientific or technological innovation.
- 5.2.1.2 Identify medical treatment as a benefit of scientific or technological innovation.

Expanded Benchmarks

5.2.2 Describe clothes fasteners (buttons, zippers etc.) as an example of scientific or technological innovation that impacts communities, cultures, and societies.

- 5.2.2.1 Recognize clothes fasteners as a benefit of scientific or technological innovation.
- 5.2.2.2 Identify clothes fasteners as a benefit of scientific or technological innovation.

5.3 Simulate collaborative problem solving and give examples of how scientific knowledge and technology are shared with other scientists and the public.

Expanded Benchmarks

5.3.1 Identify problems that can be solved through science or technology.

- 5.3.1.1 Recognize a problem.
- 5.3.1.2 Identify a problem.
- 5.3.1.3 Identify that the problem can be solved through science or technology.

Expanded Benchmarks

5.3.2 Make a plan to solve a problem.

- 5.3.2.1 Identify tools needed to solve a problem.
- 5.3.2.2 Identify how the tools will be used to solve the problem.

Expanded Benchmarks

5.3.3 Communicate the plan to solve the problem.

- 5.3.3.1 Indicate the problem to a teacher or fellow student.
- 5.3.3.2 Indicate the plan to solve the problem to a teacher or fellow student.
- 5.3.3.3 Attend to comments about the plan.

Expanded Benchmarks

5.3.4 Recognize that scientific knowledge is shared with other scientists and the public.

- 5.3.4.1 Attend to a reading passage or broadcast where scientific knowledge is being shared.
- 5.3.4.2 Recognize that the reading passage or broadcast is sharing scientific knowledge.

5.4 Use scientific knowledge to investigate problems and their proposed solutions and evaluate those solutions while considering environmental impacts.

Expanded Benchmarks

5.4.1 Identify simple environmental problems.

- 5.4.1.1 Recognize waste as a simple environmental problem.

5.4.1.2 Identify waste as a simple environmental problem.

Expanded Benchmarks

5.4.2. Propose solutions for simple environmental problems.

5.4.2.1 Recognize that recycling is a solution to waste disposal.

5.4.2.2 Identify that recycling is a solution to waste disposal.

Expanded Benchmarks

5.4.3 Determine whether a solution to a problem has been effective.

5.4.3.1 Recognize whether a solution has been effective.

5.4.3.2 Identify whether a solution has been effective.

MONTANA STANDARDS AND EXPANDED BENCHMARKS FOR SCIENCE

Science Content Standard 6

Students understand historical developments in science and technology.

Essence of Standard 6

Rationale

Students need to understand that scientific knowledge was influenced greatly by societal influences. They also need to know that scientific and technological advances have influenced society. For instance, the development of the atom bomb and the discovery that microbes cause disease both had a major impact on society. Therefore, the use of history in school science programs is necessary to clarify different aspects of scientific discovery, to understand that scientific knowledge is publicly shared and to understand the role that science has played in the development of various cultures.

Benchmarks

Grade 4

Students will:

6.1 Give historical examples of scientific and technological contributions to communities, cultures and societies.

Expanded Benchmarks

- 6.1.1 Identify that the discovery of immunizations was a major contribution to society.
 - 6.1.1.1 Recognize X-rays.
 - 6.1.1.2 Recognize that X-rays help identify health problems.

Expanded Benchmarks

- 6.1.2 Identify that the development of farming was a major contribution to society.
 - 6.1.2.1 Recognize farms and ranches.
 - 6.1.2.2 Recognize that technology is used on farms/ranches.
 - 6.1.2.3 Recognize that food is produced on farms/ranches.

6.2 Describe how scientific inquiry has produced much knowledge about the world.

Expanded Benchmarks

- 6.2.1 Identify that asking questions and answering them leads to knowledge about the world.
 - 6.2.1.1 Recognize a question.
 - 6.2.1.2 Ask a question that someone else can answer.
 - 6.2.1.3 Identify that knowledge was shared when the question was answered.

Expanded Benchmarks

- 6.2.2 Describe that answering questions about the world leads to knowledge.
 - 6.2.2.1 Find an answer to a question.
 - 6.2.2.2 Identify that knowledge increased when the question was answered.

Benchmarks

Grade 8

Students will:

6.1 Trace development that demonstrates scientific knowledge is subject to change as new evidence becomes available.

Expanded Benchmarks

- 6.1.1 Identify that the discovery of immunizations was a major contribution to society.
 - 6.1.1.1 Recognize X-rays.
 - 6.1.1.2 Recognize that X-rays help identify health problems.

Expanded Benchmarks

- 6.1.2 Identify that the development of farming was a major contribution to society.
 - 6.1.2.1 Recognize farms and ranches.
 - 6.1.2.2 Recognize that technology is used on farms/ranches.
 - 6.1.2.3 Recognize that food is produced on farms/ranches.
 - 6.1.2.4 Recognize that the ability to produce food on farms/ranches was a major contribution to society.

Expanded Benchmarks

- 6.1.3 Identify that the development of immunizations was a major contribution to society.
 - 6.1.3.1 Recognize immunizations.
 - 6.1.3.2 Recognize that immunizations protect people from diseases.
 - 6.1.3.3 Recognize that the development of immunizations as protection from disease was a major contribution to society.

6.2. Identify major milestones in science that have impacted science, technology, and society.

Expanded Benchmarks

- 6.2.1 Identify that asking questions and answering them leads to knowledge about the world.
 - 6.2.1.1 Recognize a question.
 - 6.2.1.2 Ask a question that someone else can answer.
 - 6.2.1.3 Identify that knowledge was shared when the question was answered.

Expanded Benchmarks

- 6.2.2 Describe that answering questions about the world leads to knowledge.
 - 6.2.2.1 Find an answer to a question.
 - 6.2.2.2 Identify that knowledge increased when the question was answered.

- 6.2.2.3 Describe the knowledge that was increased when the question was answered.

Expanded Benchmarks

- 6.2.3 Identify one major scientific discovery.
 - 6.2.3.1 Attend to the story of a scientific discovery.
 - 6.2.3.2 Recognize that the story tells about a scientific discovery.
 - 6.2.3.3 Identify one scientific discovery.

6.3 Describe and explain science as a human endeavor.

Expanded Benchmarks

- 6.3.1 Recognize that all people use science.
 - 6.3.1.1 Attend to people using science.
 - 6.3.1.2 Recognize that all people use science.

Benchmarks

Grade 10

Students will:

6.1 Give examples of scientific discoveries and describe the interrelationship between technological advances and scientific understanding.

Expanded Benchmarks

- 6.1.1 Identify that the discovery of immunizations was a major contribution to society.
 - 6.1.1.1 Recognize X-rays.
 - 6.1.1.2 Recognize that X-rays help identify health problems.

Expanded Benchmarks

- 6.1.2 Identify that the development of farming was a major contribution to society.
 - 6.1.2.1 Recognize farms and ranches.
 - 6.1.2.2 Recognize that technology is used on farms/ranches.
 - 6.1.2.3 Recognize that food is produced on farms/ranches.
 - 6.1.2.4 Recognize that the ability to produce food on farms/ranches was a major contribution to society.

Expanded Benchmarks

- 6.1.3 Identify that the development of immunizations was a major contribution to society.
 - 6.1.3.1 Recognize immunizations.
 - 6.1.3.2 Recognize that immunizations protect people from diseases.
 - 6.1.3.3 Recognize that the development of immunizations as protection from disease was a major contribution to society.

Expanded Benchmarks

- 6.1.4 Identify that scientific knowledge changes over time.

- 6.1.4.1 Attend to an example of scientific knowledge changing over time.
- 6.1.4.2 Recognize that scientific knowledge changes over time.
- 6.1.4.3 Identify that scientific knowledge changes over time.

Expanded Benchmarks

- 6.1.5 Recognize that technology has an impact on science.
 - 6.1.5.1 Recognize that technology changes.
 - 6.1.5.2 Recognize that people doing scientific investigation use technology.
 - 6.1.5.3 Recognize that technological improvements benefit science.

6.2 Analyze and illustrate the historical impact of scientific and technological advances.

Expanded Benchmarks

- 6.2.1 Identify that asking questions and answering them leads to knowledge about the world.
 - 6.2.1.1 Recognize a question.
 - 6.2.1.2 Ask a question that someone else can answer.
 - 6.2.1.3 Identify that knowledge was shared when the question was answered.

Expanded Benchmarks

- 6.2.2 Describe that answering questions about the world leads to knowledge.
 - 6.2.2.1 Find an answer to a question.
 - 6.2.2.2 Identify that knowledge increased when the question was answered.
 - 6.2.2.3 Describe the knowledge that was increased when the question was answered.

Expanded Benchmarks

- 6.2.3 Identify one major scientific milestone.
 - 6.2.3.1 Attend to the story of a scientific discovery.
 - 6.2.3.2 Recognize that the story tells about a scientific discovery.
 - 6.2.3.3 Identify one scientific discovery.
 - 6.2.3.4 Recognize how the discovery has impacted society.

6.3 Describe, explain, and predict science as a human endeavor.

Expanded Benchmarks

- 6.3.1 Recognize that all people use science.
 - 6.3.1.1 Attend to people using science.
 - 6.3.1.2 Recognize that all people use science.

Expanded Benchmarks

- 6.3.2 Describe people doing science.
 - 6.3.2.1 Distinguish between people doing science and people doing other activities.
 - 6.3.2.2 Identify which person is doing science when shown two people doing different activities.

6.3.2.3 Describe people doing science.